COMMERCIAL FISHING LIVELIHOODS, PERMIT LOSS, AND THE NEXT GENERATION IN BRISTOL BAY, ALASKA

By

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Abstract

Fishing people across the globe have experienced a fundamental restructuring of their livelihoods, communities, and economies as the result of shifts to rights-based fisheries management in the past half-century. The ideological underpinnings of this movement are based in neoliberalism, which is a belief system that values individualism, competition, private property, and governance by the free market. I examine some of the long-term and latent effects of this and other significant historical transitions in the fishery-dependent Bristol Bay region of Alaska. Relationships between humans and salmon in Bristol Bay evolved over thousands of years and inform the way that many fishing livelihoods are pursued today. In addition to these foundational relationships, many significant changes have occurred that have shocked and stressed the livelihood "fabric" woven many interlocking threads (i.e., the sociocultural, economic, knowledge/skill, political, natural, physical building blocks needed to construct a fishing livelihood in the region). Informed by literature review and ethnography, I describe in detail four such changes: colonization of Bristol Bay's Indigenous peoples, industrialization of the commercial fishery, implementation of a rights-based access regime (i.e., limited entry permit program), and the sockeye salmon price crash of the early 2000s. These effects linger today and raise questions for the future of the Bay and its fisheries, with respect to two particular issues: the uncertainty around the next generation of fishermen, and the severe loss of locally held permits in the Bay. To address the former, I conducted a survey of local students to measure their perceptions of the fishing industry and of community life. The results of this survey suggest that familial fishing ties, experience in the fishery, subsistence fishing activity, and household economic dependence on commercial fishing income are strong predictors of a student's desire to be engaged in commercial fishing as an adult. I examine the second issue—the loss of locally held fishing rights since the implementation of limited entry—through the combined analysis of qualitative ethnographic data and quantitative data on commercial fishery permit holdings, subsistence activity, permit holder age, and new entry trends by community and residence category. The immense loss of limited entry permits continues to challenge livelihoods because access to local fisheries is the foundation of not only the region's economy, but also of the shared identity, history, and culture of local people, family and social networks, and the mechanism by which fishing knowledge, skills, values, and ethics are transferred to the next generation. I suggest that policymakers and fishery managers dispense with neoliberal panaceas, and design fisheries policies that reflect the multiplicity of worldviews held by the policy's target populations by diversifying their own means and methods for understanding fishery systems.

Dedication

This dissertation is dedicated to my husband, Aaron Cooke. Thank you for being my person every day for the last nine years. In that time, you have imparted wisdom, deliberateness, kindness, and a love for so many things—good conversation, bourbon, world problem solving, hiking, mountains, Alaska, travel, Greenland, hunting, snowboarding, the Seattle Sounders, languages, Cincinnati chili, and learning about other people through shared experiences. You have also shown me that the best way to understand the world is to go out in it, meets its people, and see it through their eyes. I am forever appreciative of your emotional and practical support through two graduate school experiences. Thank you, and I love you.

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Chapter 1. General Introduction

1.1. Fisheries policy and neoliberalism

For much of human history, fisheries policy was a set of operational rules about fishing based on the worldview and beliefs of small groups of people and enforced by social norms (Hill et al. 2011). In many cases, norms were mediated by spiritual beliefs and altruism and enforced by other group members (Apicella et al. 2012). As human groups increased in size, so too did the difficulty in establishing and enforcing rules about fishing rights, means, methods, timing, amounts, and so on (Ostrom 1990; Ostrom et al. 1999). With this growth came what are known today as 'collective-action problems'. These problems exist outside of the context of fisheries, of course, but I will use fisheries to illustrate the concept. In essence, a collective-action problem describes a situation in which members of a group would all be better off by cooperating, but the competing interests of individuals in the group make joint action difficult (Hardin 2013; Olson 1965). A classic example of a collective action problem and its presumed solution is the so-called "tragedy of the commons" (Hardin 1968).

The tragedy of the commons holds that all common-pool resources—for example, a population of fish—not regulated by private property rights are doomed to overexploitation. This is because the rational, self-interested fisherman will take as much fish as she possibly can, otherwise her competitors will get to it first. She does so at the peril of the rest of the fishermen, and of her future self. There is no reason for fishermen to take only biologically sustainable amounts of fish, because there is nothing stopping their competitors from taking it. For these reasons, the story argues, fishermen are unable to prevent the collapse of fisheries (Ostrom et al. 1999). Although the tragedy of the commons narrative has been dismantled on theoretical (e.g., the unrealistic assumption that fishermen have no social ties or ability to communicate) and practical bases (e.g., there are many examples of cooperation in the context of common-pool resource use), the story is emblematic of how Western thought assumes that common-pool resource is a collective-action problem independent of the how well or poorly a particular system functions in practice (Longo et al. 2015; Schlager and Ostrom 1992; Schlager and Ostrom 1999)[1].

In many Western governance regimes, neoliberalism has become the *de facto* worldview that informs both our understanding of problems and the solutions to those problems in the form of contemporary fisheries policy. Briefly, neoliberalism developed from a basic idea that humans participate in exchanges free from state influence, but emphasized the values of competition (Read 2009) and private property. What was initially a theory on human nature as viewed through an economic lens eventually morphed into the justification for a particular brand of state-free, market-driven governance. Prior to this

[1] Critiques of the tragedy of the commons narrative are well represented in the collective action and public policy literature; for details, see Carothers 2010, Longo et al. 2015, and Ostrom 1990.

shift, US public policy reflected comparatively socialist attitudes, including programs to address social needs (e.g., the New Deal, the Civil Rights Act; Amenta et al. 2001). However, neoliberalism gained popularity as a governance tool in the late 1970s and early 1980s under Prime Minister Margaret Thatcher in the UK and President Ronald Reagan in the US, and has since then grown in prominence in much of the developed world (Clarke 2004; Harvey 2005).

Despite their ubiquity, significant weaknesses have been identified with neoliberal policies as applied to fisheries management. Examples include 1) ambiguity in the link between privatization and resource conservation (Essington et al. 2012), 2) inappropriate and contextually ignorant application of property rights in fisheries (Steelman and Wallace 2001), and 3) that markets do not always allocate resources efficiently given environmental and social externalities (Mansfield 2004b). Further, these policies raise ethical dilemmas regarding the privatization of public resources, pitting common-use rights against private property claims (Lam and Pitcher 2012; Macinko 1993). Perhaps most critical failure of neoliberal fisheries policy is the assumption that people are *Homo economicus,* or that they that act entirely in accordance with rational self-interested rules of behavior (Campling et al. 2012; Ostrom 1998; Pálsson 1991). Critics of rational choice theory as applied to fisheries assert that fishermen make decisions based on a multitude of factors, including social relationships, market conditions, personal and cultural identities, and temporal ecological changes in the fishery (Béné and Tewfik 2001; Cinar et al. 2013; Lopes and Begossi 2011).

As conscious, complex, social beings, humans are not well represented by the *Homo economicus* model (Barnes 1988; Jager et al. 2000). Accordingly, the individuals and groups that are most unlike *Homo economicus* tend to suffer inequitable distribution of rights and resources, and other social, cultural, and economic consequences (Pinkerton and Davis 2015; St Martin 2007). There are many examples of inequitable distribution of rights and resources, particularly with respect to the privatization of fisheries access (Carothers 2015; Chambers and Carothers 2017; Doyon 2015). Privatized fisheries in which the right to participate is a tradeable commodity are broadly referred to as license-limited fisheries (Rettig 1984; Wilen 1988). In other versions of privatization, the amount of fish that a participant is allowed to harvest is a tradable commodity; these are broadly called catch-share fisheries (see Macinko 2014; Macinko and Bromley 2003). Dimensions of inequitable distribution that have been linked to privatization of fisheries include generation (e.g., original rights holders and new entrants; Symes and Phillipson 2009; Wade-Benzoni 2002), geography (e.g., rural to urban; Mansfield 2004a; St Martin 2007), wealth (Holm et al. 2015), and ethnicity (e.g., Indigenous and non-Indigenous). For example, in Iceland, Canada, and Alaska, Individual Transferable Quota (ITQ) programs have created a feudal system of access rights in which "sea lords" own and lease quota shares (at rates from 50% to 80% of exvessel revenues) to "serf" fishermen (Helgason and Pálsson 1997; Pinkerton and Edwards 2009; Szymkowiak

and Felthoven 2016). There have also been disproportionate losses of fishing rights among Alaska Native families and communities, with those rights primarily moving to urban centers in Alaska and elsewhere in the US (Carothers 2010; Carothers 2013; Kamali 1984).

These problems take root and grow because neoliberalism—rather than being considered one of a multiplicity of ways to view collective action problems and solutions—has become so deeply engrained in Western thought that its theories, values, and predictions are assumed, are considered "common sense" (Read 2009). Rather than being just one of many inert, apolitical ways to interpret a policy problem, "the hegemony of neoliberalism is made most evident by the ways in which profoundly political and ideological projects have successfully masqueraded as a set of objective, natural, and technocratic truisms" (McCarthy and Prudham 2004: 276). Thus, neoliberalism functions as a worldview; it is the way in which many Western people make sense of the world around them. When this worldview is held by the majority of decision-makers and other politically powerful people and institutions, the existence of other worldviews in understanding policy problems or their potential solutions is rarely acknowledged, much less employed (Padilla and Kofinas 2014; Raymond-Yakoubian 2012). It is this power-laden ignorance of other worldviews in fisheries policy that constitute a major cause of social inequities in the distribution of fishing rights (Jentoft 2007).

Economics and ecology are the primary lenses through which fisheries have been viewed since the end of World War II. H. Scott Gordon's economic model of the fishery was published in 1954, and William Ricker popularized the concept of maximum sustained yield first in 1948 (Gordon 1954; Larkin 1977). These two movements instituted a research and management paradigm that remained intact until the 1970s and 1980s. Recognition of importance of social dimensions of fisheries—including behavior, place, identity, meaning, culture, health, wellbeing, equity, and justice—during this period gave rise to "new" disciplines and multidisciplinary approaches that have been both accepted and marginalized in natural resource research and management. Examples include cultural anthropology, resilience and adaptation (e.g., Robards and Greenberg 2007), social-ecological systems (SES; Schoon and Van der Leeuw 2015), Ecosystem-Based Fishery Management (EBFM; e.g., Fulton et al. 2014), political ecology (e.g., Andreatta and Parlier 2010), and Indigenous and decolonizing methodologies (e.g., McGregor 2004).

Despite the recent widening of the aperture on fishery management in the last 30 years and the inclusion of a greater diversity of intellectual practice, the trans- or multidisciplinary character of fisheries management and research is still lacking. The practitioners of each discipline remain ideologically isolated from one another and tend not to seek conceptualizations of or solutions to fishery management problems beyond their own disciplinary boundaries. The tendency to "stick with our own kind" inhibits creative problem-solving and the ability of decision-makers to reach compromise. Further, very few of

these disciplines explicitly address the roles of power, social justice, and equity in fisheries policy. The powerless continue to be underrepresented in centralized governance regimes (e.g., the North Pacific Fishery Management Council, the Alaska Board of Fisheries), which contributes to a negative feedback loop in which decision-makers are ever more isolated from those that do not share their worldview (Okey 2003). Thus, the relative absence of social considerations in fishery management is a worldview problem; if social dynamics are not part of how we implicitly view the world and its workings, then there is little chance that our fisheries policies will adequately address social considerations like equity, culture, health, and wellbeing.

1.2. Scope

In this dissertation, I examine the schism between neoliberal policy and the multiplicity of worldviews that exist in the context of fisheries management and research. Fisheries, and the question of who has the right to fish, have been a focal point of public policy since the Magna Carta (Walters 1997). In Alaska, fisheries have been the site of privatization of public resources since the 1890s, which has taken various forms, including fish traps owned by Seattle-based canneries, the limited entry permit program in state fisheries, and Individual Fishing Quotas (IFQs) in federal halibut and sablefish fisheries (Cooley 1963; Knapp 1997; Rogers 1979). Neoliberal thought has reinforced the contemporary conceptualization of fisheries as systems of renewable resources, firms, and market exchange of commodities, especially in Alaska's state and federal waters.

Fishing communities in Bristol Bay, Alaska, are a unique site from which to observe fisheries policy and management in action. First and foremost, the social and cultural significance of the fisheries to the people of the Bristol Bay region is relatively unique in the world, especially considering the increasingly industrialized nature (i.e., vertically integrated, disconnection from coastal communities) of commercial fisheries around the world (Holen 2017; Mansfield 2011). Further, studies of policy and fishery-dependent livelihoods do not often consider rural communities in WEIRD—Western, educated, industrialized, rich, and democratic—nations, choosing instead to focus on communities where those livelihoods are relatively more abundant (e.g., the global south; poor nations with weak central governance structures). Bristol Bay presents the opportunity to examine policy choices among rural fishing communities that differ geographically, economically, and ideologically from the vast majority of communities in the rest of the US and the developed world.

Bristol Bay communities are also the ancestral home of the Central Yup'ik, Dena'ina, and Sugpiaq peoples. Indigenous peoples have been stewards of lands and resources in the region for tens of thousands of years, and have relationships to salmon that cannot be reduced to unidimensional neoliberal framings (Fall et al. 2010; Napoleon 1996). In these communities, fishing for salmon is a way of life, a collective and individual identity (Reedy-Maschner 2013), a vehicle for self-determination and reciprocal care for

non-human persons (i.e., humans treat salmon with respect, salmon reciprocate; Kawagley 2006), a rich source of nutrition (Loring and Gerlach 2009; Lowe 2007), and a means by which social relationships are reinforced (Morris 1985). Fishing in Bristol Bay and elsewhere is built on a foundation of social networks through which knowledge, skills, values, ethics, materials (e.g., fishing gear, vessels, fuel), and food move among individuals, families, and communities (Holen 2014; Lavoie and Himes-Cornell 2019). Many of these cultural elements have been adopted by non-Indigenous people as well, creating a blended fishery-dependent culture that is characteristic of many coastal communities in Alaska (Braund 2017; Reedy-Maschner 2010).

Bristol Bay's salmon fisheries are the main economic driver in the region. Landings taxes and dollars spent in local retail, service, and marine-support sectors in Bristol Bay communities fund local schools, fishery infrastructure, and utilities and healthcare services (Knapp et al. 2013). In addition, local permit holders account for 90% of the dollars spent on income to local fishermen and 60% of the expenditures on local transportation and food (Northern Economics 2009). The commercial fishing industry is the second largest in the state, behind the oil industry; it provides jobs for Alaskans (and people from all over the world) and revenues that support state government services (Kruse et al. 2011). Alaska's fishing industry is important to the US economy as well, and is the source of over $12 billion in direct output and multiplier effects (McDowell Group 2017). Nearly half (48%) of US seafood landings by volume are from Alaskan ports, and Bristol Bay's ports rank second in the US in terms of value ($218.3 million) and ninth in volume (229 million pounds) of commercial fishery landings (National Oceanic and Atmospheric Administration 2017).

1.3. Theoretical and methodological frameworks

In this dissertation I use several research frameworks that have broadened the traditional economic-ecological fisheries research and management paradigm to include social and cultural dimensions. Political ecology emphasizes considerations of power, scale, change, and critique in research on human-environment systems. Drawing on anthropology, geography, and political economy, political ecology engages with questions of resource use in the context of the "uneven distribution of wealth, opportunity, and power and the consequent prominent roles that categories of difference, such as social and economic class, can play in shaping human-resource relationships" (Carothers 2015). I blend political ecology concepts of power, scale, and change with the livelihood sustainability framework, which examines the strategies and capital assets that people use to build and maintain resource-dependent livelihoods, but does not assume that livelihood fishermen are *Homo economicus* (Scoones 1998; Scoones 2009). I also incorporate elements of decolonial research to bring into focus the multigenerational impacts of colonization of Bristol Bay's Indigenous peoples on their social, cultural, economic, and environmental

health. Further, in decolonizing Bristol Bay's history, I link past injustices to continuing colonialism in contemporary fisheries management.

The methodological frameworks employed in this research bring together quantitative and qualitative approaches in parallel and in synthesis. Throughout this research project, I drew upon a diverse breadth of historical and contemporary Bristol Bay literature, including a systematic review of peer-reviewed journal articles, books, government reports, case law, and graduate theses, as well as an opportunistic review of memoirs, newspaper and magazine articles, and archived letters. I also spent two years conducting ethnographic field research, including semi-directed interviews and surveys, and analyzed these data using text analysis and grounded theory methods (Strauss and Corbin 1990; Bernard 2011). I derived fishing industry and community attitude indices from Likert scales, and analyzed survey data using logit regression methods in an information theoretic and multimodel inference framework (Burnham and Anderson 2002). Lastly, time series regression of permit distribution data informed by emergent ethnographic themes constitute the major synthetic approach in this research project (Cleveland and Devlin 1988).

1.4. Objectives of research

My objectives in this dissertation are to 1) link neoliberalism and fisheries management to social inequities and cultural consequences in a case study fishery system in Bristol Bay, Alaska; 2) examine the ways that local fishing livelihoods have been challenged and changed by neoliberal fisheries management; 3) synthesize the meaning of those changes for the current and future generations of fishing livelihoods; and 4) provide an example of and rationale for using multiple data types and disciplinary frameworks to investigate the inequitable distribution of fishing rights.

1.5. Dissertation overview

This dissertation is comprised of three analytical chapters, followed by a general conclusion chapter. Chapter 2 draws on ethnographic research with community leaders and fishery participants in four Bristol Bay communities to explore the foundations of fishing livelihoods as they have changed since time immemorial. I describe colonialism, commercialization of the fisheries in the 19th century, fishery access privatization in the 20th century, and large-scale social, technological, and economic change in the late 20th and early 21st centuries as shocks and stressors to the sustainability of local fishing livelihoods among Bristol Bay residents. In Chapter 3, I use survey data from middle and high school students in four study communities to document youth perceptions of commercial fishing and community life. The survey results are then viewed in the broader context of the "graying of the fleet" trend, and uncertainties about who the next generation of Bristol Bay fishermen will be. Chapter 4 uses qualitative ethnographic findings from Chapters 2 and 3 to contextualize qualitative data on permit loss trends in the Bristol Bay fisheries, and to synthesize a more robust understanding of the cumulative impacts of the loss of locally

held fishing rights, fishery privatization, cultural change, and youth exposure to fishing on the future of the Bristol Bay region and its fisheries.

1.6. References

Amenta, E., Bonastia, C. and Caren, N. 2001. US social policy in comparative and historical perspective: concepts, images, arguments, and research strategies. *Annual Review of Sociology,* 27(1): 213-234.

Andreatta, S. and Parlier, A. 2010. The political ecology of small-scale commercial fishermen in Carteret County, North Carolina. *Human Organization* 69(2): 180-191.

Apicella, C.L., Marlowe, F.W., Fowler, J.H. and Christakis, N.A. 2012. Social networks and cooperation in hunter-gatherers. *Nature,* 481: 497-502.

Barnes, T.J. 1988. Rationality and relativism in economic geography: an interpretive review of the *homo economicus* assumption. *Progress in Human Geography* 12(4): 473-496.

Béné, C. and Tewfik, A. 2001. Fishing effort allocation and fishermen's decision making process in a multi-species small-scale fishery: Analysis of the conch and lobster fishery in Turks and Caicos Islands. *Human Ecology,* 29(2): 157-186.

Bernard, H.R. 2011. *Research methods in anthropology: qualitative and quantitative approaches*: Rowman Altamira.

Braund, S.J. 2017. Set the net: the heritage significance of fish camp and wild salmon in Bristol Bay, Alaska. PhD dissertation. Missoula: University of Montana.

Burnham, K.P. and Anderson, D.R. 2002. *Model selection and multimodel inference: A practical information-theoretical approach*. 2nd ed. New York: Springer-Verlag.

Campling, L., Havice, E. and McCall Howard, P. 2012. The political economy and ecology of capture fisheries: market dynamics, resource access and relations of exploitation and resistance. *Journal of Agrarian Change,* 12(2-3): 177-203.

Carothers, C. 2010. Tragedy of commodification: displacements in Alutiiq fishing communities in the Gulf of Alaska. *Maritime Studies,* 9(2): 95-120.

Carothers, C. 2013. A survey of US halibut IFQ holders: market participation, attitudes, and impacts. *Marine Policy,* 38: 515-522.

Carothers, C. 2015. Fisheries privatization, social transitions, and well-being in Kodiak, Alaska. *Marine Policy,* 61: 313-322.

Chambers, C. and Carothers, C. 2017. Thirty years after privatization: a survey of Icelandic small-boat fishermen. *Marine Policy,* 80: 69-80.

Cinar, E.M., Johnson, J. and Palmer, A. 2013. Decision making: Fishing production and fishers in the Black Sea. *Fisheries Research,* 147: 296-303.

Clarke, J. 2004. Dissolving the public realm? the logics and limits of neo-liberalism. *Journal of Social Policy,* 33(1): 27-48.

Cleveland, W.S. and Devlin, S.J. 1988. Locally weighted regression: an approach to regression analysis by local fitting. *Journal of the American Statistical Association,* 83(403): 596-610.

Cooley, R.A. 1963. Politics and conservation: the decline of the Alaska salmon. New York: Harper & Row.

Doyon, S. 2015. Losing ground: The marginalization of the St. Lawrence eel Fisheries in Quebec, Canada. *Marine Policy,* 61: 331-338.

Essington, T.E., Melnychuk, M.C., Branch, T.A., Heppell, S.S., Jensen, O.P., Link, J.S., Martell, S.J.D., Parma, A.M., Pope, J.G. and Smith, A.D.M. 2012. Catch shares, fisheries, and ecological stewardship: a comparative analysis of resource responses to a rights-based policy instrument. *Conservation Letters,* 5(3): 186-195.

Fall, J.A., Holen, D., Krieg, T.M., La Vine, R., Stickman, K., Ravenmoon, M., Hay, J. and Stariwat, J. 2010. The Kvichak watershed subsistence salmon fishery: an ethnographic study. Alaska Department of Fish and Game, Anchorage, Alaska.

Fulton, E.A., A.D. Smith, D.C. Smith and P. Johnson. 2014. An integrated approach is needed for ecosystem based fisheries management: insights from ecosystem-level management strategy evaluation. *PLoS ONE* 9(1): e84242.

Gordon, H.S. 1954. The economic theory of a common-property resource: the fishery. *Journal of Political Economy,* 62(2): 124-142.

Hardin, G. 1968. The tragedy of the commons. *Science,* 162(3859): 1243-1248.

Hardin, R. 2013. *Collective action.* New York: Routledge.

Harvey, D. 2005. *A brief history of neoliberalism.* New York: Oxford University Press.

Helgason, A. and Pálsson, G. 1997. Contested commodities: the moral landscape of modernist regimes. *Journal of the Royal Anthropological Institute*: 451-471.

Hill, K.R., Walker, R.S., Božičević, M., Eder, J., Headland, T., Hewlett, B., Hurtado, A.M., Marlowe, F., Wiessner, P. and Wood, B. 2011. Co-residence patterns in hunter-gathere societies show unique human social structure. *Science,* 331(6022): 1286-1289.

Holen, D. 2014. Fishing for community and culture: the value of fisheries in rural Alaska. *Polar Record,* 50(04): 403-413.

Holen, D. 2017. Subsistence and commercial fisheries through the lenses of culture and economy in three coastal Alaskan communities. PhD dissertation. Fairbanks: University of Alaska Fairbanks.

Holm, P., Raakjær, J., Jacobsen, R.B. and Henriksen, E. 2015. Contesting the social contracts underpinning fisheries—lessons from Norway, Iceland and Greenland. *Marine Policy,* 55: 64-72.

Jager, W., M.A. Janssen, H.J.M. De Vries, J. De Greef and C.A.J. Vlek. 2000. Behaviour in commons dilemmas: Homo economicus and Homo psychologicus in an ecological-economic model. *Ecological Economics* 35(2000): 357-379.

Jentoft, S. 2007. In the power of power: the understated aspect of fisheries and coastal management. *Human Organization,* 66(4): 426-437.

Kamali, N. 1984. Alaskan Natives and limited entry fisheries of Alaska: a study of changes in the distribution of permit ownership amongst Alaskan Natives, 1975–1983. Commercial Fisheries Entry Commission Report Number 84–8, Juneau, Alaska.

Kawagley, A.O. 2006. *A Yupiaq worldview: a pathway to ecology and spirit.* Long Grove, IL: Waveland Press, Inc.

Knapp, G. 1997. Initial effects of the Alaska halibut IFQ program: survey comments of Alaska fishermen. *Marine Resource Economics,* 12(3): 239-248.

Knapp, G., Guettabi, M. and Goldsmith, S. 2013. The economic importance of the Bristol Bay salmon industry: A report prepared for the Bristol Bay Regional Seafood Development Association. Anchorage, AK: Institute of Social and Economic Research.

Kruse, S., K. Sheeran and T. Hesselgrave, 2011. The value of commercial fisheries near Bristol Bay, Alaska. Report prepared by Ecotrust for the World Wildlife Fund, Portland, Oregon.

Lam, M.E. and Pitcher, T.J. 2012. The ethical dimensions of fisheries. *Current Opinion in Environmental Sustainability,* 4(3): 364-373.

Larkin, P.A. 1977. An epitaph for the concept of maximum sustained yield. *Transactions of the American Fisheries Society,* 106(1): 1-11.

Lavoie, A. and Himes-Cornell, A. 2019. Social networks of Alaska fishing communities. *Coastal Management*: 1-22.

Longo, S.B., Clausen, R. and Clark, B. 2015. *The tragedy of the commodity: oceans, fisheries, and aquaculture.* New Brunswick, NJ: Rutgers University Press.

Lopes, P. and Begossi, A. 2011. Decision-making processes by small-scale fishermen on the southeast coast of Brazil. *Fisheries Management and Ecology,* 18(5): 400-410.

Loring, P.A. and Gerlach, S.C. 2009. Food, culture, and human health in Alaska: an integrative health approach to food security. *Environmental Science & Policy,* 12(4): 466-478.

Lowe, M.E. 2007. Socioeconomic review of Alaska's Bristol Bay Region. Prepared for the North Star Group. Anchorage, AK: Institute of Social and Economic Research.

Macinko, S. 1993. Public or private: United States commercial fisheries management and the public trust doctrine, reciprocal challenges. *Natural Resources Journal*: 919-955.

Macinko, S. 2014. Lipstick and catch shares in the Western Pacific: beyond evangelism in fisheries policy? *Marine Policy,* 44: 37-41.

Macinko, S. and Bromley, D.W. 2003. Property and fisheries for the twenty-first century: seeking coherence from legal and economic doctrine. *Vermont Law Review,* 28: 623.

Mansfield, B. 2004a. Neoliberalism in the oceans: "rationalization", property rights, and the commons question. *Geoforum,* 35(3): 313–326.

Mansfield, B. 2004b. Rules of privatization: contradictions in neoliberal regulation of North Pacific fisheries. *Annals of the Association of American Geographers,* 94(3): 565-584.

Mansfield, B. 2011. "Modern" industrial fisheries and the crisis of overfishing. In Peet, R., Robbins, P., & Watts, M. (eds.) *Global Political Ecology.* London: Routledge, Pp. 84-99.

McCarthy, J. and Prudham, S. 2004. Neoliberal nature and the nature of neoliberalism. *Geoforum,* 35(3): 275-283.

McDowell Group 2017. The economic value of Alaska's seafood industry. Report prepared for the Alaska Seafood Marketing Institute, Anchorage, Alaska.

McGregor, D. 2004. Coming full circle: Indigenous knowledge, environment, and our future. *American Indian Quarterly* 28(3-4): 385-410.

Morris, J.M. 1985. The use of fish and wildlife resources by residents of the Bristol Bay Borough, Alaska. Anchorage: Alaska Department of Fish and Game.

Napoleon, H. 1996. *Yuuyaraq: the way of the human being.* Fairbanks, Alaska: Alaska Native Knowledge Network.

National Oceanic and Atmospheric Administration 2017. Total commercial fishery landings at major US ports summarized by year and ranked by dollar value. NOAA National Marine Fisheries Service Commercial Fisheries Statistics. Retrieved from https://www.st.nmfs.noaa.gov/commercial-fisheries/commercial-landings/other-specialized-programs/total-commercial-fishery-landings-at-major-u-s-ports-summarized-by-year-and-ranked-by-dollar-value/index

Northern Economics 2009. The importance of the Bristol Bay salmon fisheries to the region and its residents. Report prepared for the Bristol Bay Economic Development Corporation, Anchorage, Alaska.

Okey, T.A. 2003. Membership of the eight Regional Fishery Management Councils in the United States: are special interests over-represented? *Marine Policy,* 27(3): 193-206.

Olson, M.J. 1965. *The logic of collective action.* Cambridge, MA: Harvard University Press.

Ostrom, E. 1990. Governing the commons: the evolution of institutions for collective action. Cambridge, UK: Cambridge University Press.

Ostrom, E. 1998. A behavioral approach to the rational choice theory of collective action: presidential address, American Political Science Association, 1997. *The American Political Science Review,* 92(1): 1-22.

Ostrom, E., Burger, J., Field, C.B., Norgaard, R.B. and Policansky, D. 1999. Revisiting the commons: local lessons, global challenges. *Science,* 284(5412): 278-282.

Padilla, E. and Kofinas, G.P. 2014. "Letting the leaders pass": barriers to using traditional ecological knowledge in comanagement as the basis of formal hunting regulations. *Ecology and Society,* 19(2).

Pálsson, G. 1991. Coastal economies, cultural accounts: human ecology and Icelandic discource. New York: Manchester University Press.

Pinkerton, E. and Davis, R. 2015. Neoliberalism and the politics of enclosure in North American small-scale fisheries. *Marine Policy,* 61(2015): 303-312.

Pinkerton, E. and Edwards, D.N. 2009. The elephant in the room: the hidden costs of leasing individual transferable fishing quotas. *Marine Policy,* 33(4): 707-713.

Raymond-Yakoubian, J. 2012. Participation and resistance: tribal involvement in Bering Sea fisheries management and policy. In Carothers, C., Criddle, K. R., Chambers, C. P., Cullenberg, P. J., Fall, J. A., Himes-Cornell, A. H., Johnsen, J. P., Kimball, N. S., Menzies, C. R. & Springer, E. S. (eds.) *Fishing People of the North: Cultures, Economies, and Management Responding to Change*. Fairbanks: Alaska Sea Grant University of Alaska Fairbanks, Pp. 117-130.

Read, J. 2009. A genealogy of homo-economicus: neoliberalism and the production of subjectivity. *Foucault Studies*: 25-36.

Reedy-Maschner, K.L. 2010. Aleut identities: tradition and modernity in an indigenous fishery. Montreal: McGill-Queen's Press.

Reedy-Maschner, K.L. 2013. Salmon politicians: mapping boundaries, resources, and people at the Bristol Bay–Aleutian border. *Society & Natural Resources,* 26(5): 554-567.

Rettig, R.B. 1984. License limitation in the United States and Canada: an assessment. *North American Journal of Fisheries Management,* 4(3): 231-248.

Robards, M.D. and J.A. Greenberg. 2007. Global constraints on rural fishing communities: whose resilience is it anyway? *Fish and Fisheries* 8(1): 14-30.

Rogers, G.W. 1979. Alaska's limited entry program: another view. *Journal of the Fisheries Board of Canada,* 36(7): 783-788.

Schlager, E. and Ostrom, E. 1992. Property-rights regimes and natural resources: a conceptual analysis. *Land Economics*: 249-262.

Schlager, E. and Ostrom, E. Property-rights regimes and coastal fisheries: an empirical analysis. Polycentric Governance and Development: Readings from the Workshop in Political Theory and Policy Analysis, 1999. Ann Arbor: The University of Michigan Press, Pp. 99-104.

Schoon, M. and Van der Leeuw, S. 2015. The shift toward social-ecological systems perspectives: insights into the human-nature relationship. *Natures Sciences Sociétés* 23(2): 166-174.

Scoones, I. 1998. Sustainable rural livelihoods: a framework for analysis. *Institute of Development Studies Working Paper,* 72: 1-22.

Scoones, I. 2009. Livelihoods perspective and rural development. *The Journal of Peasant Studies,* 36(1): 171-196.

St Martin, K. 2007. The difference that class makes: neoliberalization and non-capitalism in the fishing industry of New England. *Antipode,* 39(3): 527-549.

Steelman, T.A. and Wallace, R.L. 2001. Property rights and property wrongs: why context matters in fisheries management. *Policy Sciences,* 34(3/4): 357-379.

Strauss, A.L. and Corbin, J.M. 1990. *Basics of qualitative research.* Newbury Park, CA: Sage Publishers.

Symes, D. and Phillipson, J. 2009. Whatever became of social objectives in fisheries policy? *Fisheries Research,* 95(1): 1-5.

Szymkowiak, M. and Felthoven, R. 2016. Understanding the determinants of hired skipper use in the Alaska halibut individual fishing quota fishery. *North American Journal of Fisheries Management,* 36(5): 1139-1148.

Wade-Benzoni, K.A. 2002. A golden rule over time: reciprocity in intergenerational allocation decisions. *Academy of Management Journal,* 45(5): 1011-1028.

Walters, M.D. 1997. Aboriginal rights, Magna Carta and exclusive rights to fisheries in the waters of Upper Canada. *Queen's Law Journal,* 23: 301.

Wilen, J.E. 1988. Limited entry licensing: a retrospective assessment. *Marine Resource Economics*: 313-324.

Chapter 2. Livelihoods, policy, and change in the fishing communities of Bristol Bay, Alaska[1]

2.1. Abstract

Policies based on incomplete or ill-fitting understandings of small-scale fishery systems constitute shocks and persistent stresses to the sustainability of fishing livelihoods. Contemporary fisheries management discourses depict fisheries as economic systems composed of autonomous rational actors, and tend to omit the social, cultural, and place-based nature of fishing livelihoods. Here, we view a case-study fishery system—the Bristol Bay, Alaska, salmon fishery—through the lens of the sustainable livelihoods framework. We also incorporate considerations of power, discourse, change, and scale in our understanding of how persistent stresses and acute shocks over the long term have altered socio-ecological systems that fishing livelihoods in the Bristol Bay region depend on. We argue that several key stresses—Russian and American colonization, industrialization of the commercial fishery, and privatization of fishery access rights—have had significant, multigenerational impacts on the ability of local fishermen to pursue and sustain fishing livelihoods. To better understand and equitably manage natural resource systems like this fishery, these historical legacies and the inequalities and disenfranchisement from thousands of years of fishing livelihoods that have resulted from ill-fitting fisheries policies need to be central to, not absent from, consideration.

2.2. Introduction

Fisheries have long been characterized, managed, and critiqued as systems of biological and economic inputs and outputs (e.g., Arnason 2005; Bell 1972; Costello et al. 2008; Crutchfield 1979; Gordon 1954; Hardin 1968). This approach to understanding fisheries came about in the 1950s in response to problems of overfishing and overcapacity, and progressed towards the singular solution of marketized private property rights in a neoliberal[2] framework beginning in the 1970s (Gordon 1954; Hardin 1968; Tussing et al. 1972). Around the world, this characterization has transformed fisheries into profit- and efficiency-driven systems of industrialized, vertically integrated firms competing for wild resources and participating in market exchanges of goods (Hébert 2014; Pinkerton and Davis 2015). Put differently, the neoliberal framing of fisheries did not describe things as they were; it pushed fisheries to fit the mold of neoliberal ideals such as governance by the free market, competition, and the presumption of rational economic and environmental behavior engendered by private property rights (Mansfield 2004; Brown 2016).

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[1] Coleman, J. M., R. Donkersloot, C. Carothers, D. Ringer, and P. Cullenberg. Manuscript submitted for publication to the *Journal of Political Ecology*.

[2] Neoliberalism is a belief system in which economic rationality, self-regulating markets, and private property rights are highly valued principles (Polanyi 1957, Watts 1994, McCarthy and Prudham 2004).

In small-scale, owner-operator fisheries, such framings necessarily omit the social, economic, cultural, and place-based nature of fishing livelihoods, or that livelihoods are part of a fishery system at all (Crosson 2011; Power et al. 2014; Williams 2008). The roles of power and equity in how livelihoods are pursued by individuals, families, and communities and sustained over the long term are given even less attention in contemporary fisheries management and policymaking (Carothers 2008; Symes and Phillipson 2009). The scale of analysis in neoliberal framings tends to be at the fleet level, and rarely at the level of the vessel, individual, family, or community. Analyses of crew and captain livelihood and community sustainability are typically reserved for sociological or anthropological studies, which are given far less weight than economic and biological studies in fisheries policymaking (Jentoft 2000) due in part to the complex and qualitative nature of individual or community-level data and dominant discourses that value economic and biological metrics over social and cultural indices (Breslow et al. 2016; Moon and Blackman 2014).

Policies based on ill-fitting characterizations have historically had negative impacts on those individuals, families, and communities whose livelihoods depend on fishing (Copes and Charles 2004; Olson 2011). Numerous examples of ill-fitting fisheries policies can be found worldwide, including Iceland (Chambers 2016; Eythórsson 2000), Atlantic Canada (Foley et al. 2015), New Zealand (Yandle and Dewees 2008), and the United States (Carothers 2011; Carothers and Chambers 2012). In developed nations, one of the most significant stresses to fishery systems in recent decades has been the privatization and commodification of fishery access rights. These policy regimes and their direct and indirect effects, we argue, constitute acute shocks and persistent stresses to fishing livelihood and community sustainability.

Privatized-access fisheries, in which a specified share of the total allowable catch is allocated to an individual or vessel, are designed to consolidate fishery access rights and improve fleet-wide efficiency of harvest. However, there are several individual transferable quota (ITQ) fisheries that have experienced rights consolidation far beyond the level expected when the programs were implemented (Carothers et al. 2010; Crowley and Palsson 1992; Eythórsson 2000; Grainger and Costello 2016). In ITQ and license-limited fisheries (i.e., only vessels/individuals with access rights may fish, but catches are not individually allocated) wherein rights are transferable, rights have tended to move from rural fishing-dependent communities to urban areas (Carothers et al. 2010; Foley et al. 2015; Harling Stalker and Phyne 2014; Himes-Cornell and Hoelting 2015). Detachment of rights and livelihoods from fishing places and cultures is, proximately, a product of people selling rights to nonlocal residents and people moving from rural to urban communities, but is ultimately a product of making fishing rights an alienable commodity (Knapp 2011; Langdon 1980).

Shifts in distributional equity in terms of rights and wealth have also spurred social, economic, and political transitions in fisheries. Perceived social values in fishing, i.e., what makes a commercial fisherman[3], including cooperation, skill, and stewardship, have been replaced by competitiveness, luck, and materialism (Berkes 2010; Carothers 2010; Carothers 2015). As rights concentrate away from local communities, power and agency in decision-making processes has also been redistributed to urban centers (Acheson 2013; Barnett and Eakin 2015; Chambers and Carothers 2017; Højrup 2011). Fishing rights have been concentrated not only spatially, but racially and demographically as well. Indigenous fishermen and communities have been particularly hurt by resource privatization (Carothers and Chambers 2012; McCormack 2017). The average age of rights holders in privatized fisheries invariably climbs as the burdens of market-based access and the high financial costs fall to younger generations of fishermen (Donkersloot and Carothers 2016; Rosvold 2007). Significant barriers to entry have been documented in rights-based fisheries across the world, including access to capital needed to purchase fishing rights (Cullenberg et al. 2017; Gislason and Associates Limited 2013; White 2015).

None of this is to say that privatization of fisheries has not had positive outcomes; certainly, many individuals and groups of fishery stakeholders have benefitted greatly from privatization. The crux of the issue is that the benefits of privatization accrue to fishermen whose motivations and behavior align well with neoliberal principles and those that were initially given rights, while fishermen whose motivations and behavior reflect livelihood strategies embedded in rural fishing communities and future generations of fishermen tend to bear the costs (Carothers 2013; Hébert 2014; Holen 2014; Breslow 2015). In order to avoid or reverse these negative consequences, fisheries must be reimagined as social as well as biological and economic systems. The shifts described above are the result of institutional pressures on multiple aspects of commercial fishing specifically, and of policy that imagines fishermen as individual, autonomous, universal rational actors in a market when in reality they are diverse people embedded within kin, social, and community systems with varied motivations and strategies for living their lives as fishermen (Cinner et al. 2009; Daw et al. 2012). In other words, for many people living and working in fishing communities, fishing is a livelihood. Thus, we will examine the dynamics of a case-study fishery system through the lens of fishing as livelihood.

In developing a framework for analyzing agriculture-based livelihoods, Scoones (1998) suggested that "a livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living." Further, he defined livelihood sustainability as the condition in which a livelihood "can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets, while not undermining the natural resource base" (Scoones 1998). Livelihoods

[3] We use the term 'fisherman' to mean a commercial fish harvester of any gender, as it is how our research participants referred to themselves.

also encompass tradition, history, values, and cultural ties, and are built upon kin-based or other social networks embedded in a community (Larsen 2004). In the case of natural resource-dependent livelihoods the community is likely to be a place, while other, more geographically transient livelihoods may be embedded in communities of interest (Cramer et al. 2018; Macinko 2007). Livelihoods are often defined by knowledge and practice, but also by connections to place (i.e., the meanings attached to a physical location or geographic feature; Poe et al. 2016). In fishing livelihoods, place plays an important role in defining one's identity, and shapes knowledge, practice, and belief tied to fishing. Using both a political ecology framework and sustainable livelihoods approach (SLA), we explore the impacts of several agents of change on fishing livelihoods and communities, using the Bristol Bay salmon fishery as a case study.

To illustrate livelihoods in the context of change, Scoones (1998) poses a key question in the livelihood sustainability framework:

> given a particular context (of policy setting, politics, history, agroecology and socio-economic conditions), what combination of livelihood resources … result in the ability to follow what combination of livelihood strategies … with what outcomes? Of particular interest in this framework are the institutional processes (embedded in a matrix of formal and informal institutions and organizations) which mediate the ability to carry out such strategies and achieve (or not) such outcomes. (Scoones 1998: 3)

This approach, designed to investigate agricultural livelihoods, will be adapted here for the fishing context. Further, the SLA has largely been used to describe agriculture and fisheries in developing nations. Here, we apply the framework to a rural area and Indigenous homelands in one of the wealthiest and most politically and socially influential nations in the world. Inclusion of Indigenous fishing livelihoods in an SLA approach provides needed context on the colonization and expropriation that continues to occur in Alaska and the rest of the US. These considerations reject the idea that only the rural poor in developing nations struggle to sustain fishing livelihoods and affirms that fishing livelihood sustainability is eroded by management institutions, even in wealthy, democratic nations.

There are four areas in which SLA has been deficient: discourse (knowledge), power (politics), change, and scale (Scoones 2009). We aim to address the roles of discourse, power, change, and scale in the livelihood sustainability in Bristol Bay fishing communities explicitly in this paper. In the preceding paragraphs we considered the neoliberal discourses—economic efficiency, commodification of access rights—that have had profound and lasting effects on fishery systems across the globe. From this understanding we will discuss the ways in which these discourses have fundamentally restructured individual livelihoods and communities in Bristol Bay. To address the lack of consideration given to power dynamics in the previous applications of SLA, we aim to explore the ability (or lack thereof) of local people to advocate for their needs as fishermen and as people with multigenerational ties to the region, and the social and racial injustices that have characterized the commercial fishery since its inception. Another central focus in the following discussion is that of change; that the sustainability of

fishing livelihoods has changed and continues to change is evidenced by the graying of the fleet, and rural-to-urban and Indigenous-to-non-Indigenous migration trends. To ignore the large-scale shifts in ocean productivity, access privatization, global seafood market dynamics, and cultural and social change that have occurred in the region over the fishery's history is to ignore all that has shaped fishing livelihoods in Bristol Bay as they are pursued today. The consideration of change in sustainable livelihoods also begs the question of how the sustainability of fishing livelihoods is affected by factors that change across space as well as time. In addition to discourse, power, and change through time, Scoones calls for more explicit and rigorous characterization of the dynamics, institutional pressures, and processes occurring on local-to-global scales that affect livelihoods and their sustainability. Considerations of power, discourse, temporal change, and geographic scale will bring to these questions of livelihood sustainability a broader, deeper, and more critical understanding of management and policy outcomes.

As part of our critique of the neoliberal discourses that have shaped fishing livelihoods, we abandoned the language that is commonly used in such discourses and in the SLA literature. For instance, Scoones (1998) and Hulme et al. (2001) use the term "capital assets" to describe the resources upon which one draws to build and sustain a livelihood. Conceiving livelihood resources in this way furthers the tendency to imagine fisheries as simply a disconnected system of economic transactions amongst rational actors. Further, calling them "assets" in the context of conceptually limited economic framings fails to recognize the interconnectedness between necessary parts of fishing livelihoods. For instance, family (a sociocultural "asset") and cash (an economic "asset") function jointly to provide young fishermen access to fishing rights as they begin their fishing livelihoods; family is often a source of cash for financing fishing permits, and in some cases, fishermen will pay remittances to family members who have helped them purchase fishing rights. To direct our collective thinking about fishing livelihoods away from that of narrowly defined neoliberal framings, we propose to abandon the term "assets" in favor of the following conceptual metaphor. Livelihoods may be thought of as a fabric composed of multiple, interwoven threads (Figure 2.1). Together, these threads—the "assets"—create the fabric, which is stronger and larger than each thread individually. As each thread frays, the strength of the fabric is compromised, but not necessarily destroyed. However, there is a point at which the fabric becomes damaged, beyond which it is just a pile of threads. Thinking in terms of "threads" recognizes the interdependence of each part of people's livelihoods for a more robust understanding of livelihood sustainability.

A final note on the boundaries of the following discussion concerns sustainability itself; how do we know whether a livelihood is sustainable over the long term? We will explore, through the words and experiences of those whose livelihoods are predicated on the commercial fishery, the factors affecting livelihood sustainability in Bristol Bay. However, measuring the sustainability of something as complex

and understudied as fishing livelihoods in one place and at one moment in time is an undertaking far beyond the scope of this or any singular study. Our purpose with the following discussion is to explore the institutional drivers of change in the constituent threads of fishing livelihoods in Bristol Bay, and to describe qualitatively the perceived impacts of those changes. Because definitive assessment of whether or not livelihoods are or are not sustainable must necessarily follow a baseline understanding of livelihoods in all their complexity, doing so must remain a task for a future date.

The research questions that will guide the following discussion of sustainable fishing livelihoods in Bristol Bay, Alaska, are:

1. What are the natural, economic/financial, human, physical, sociocultural, political threads that support fishing livelihoods?
2. What are the changes in these necessary threads (particularly with respect to entry into and participation in the commercial fishing industry) that fishermen have experienced and observed?

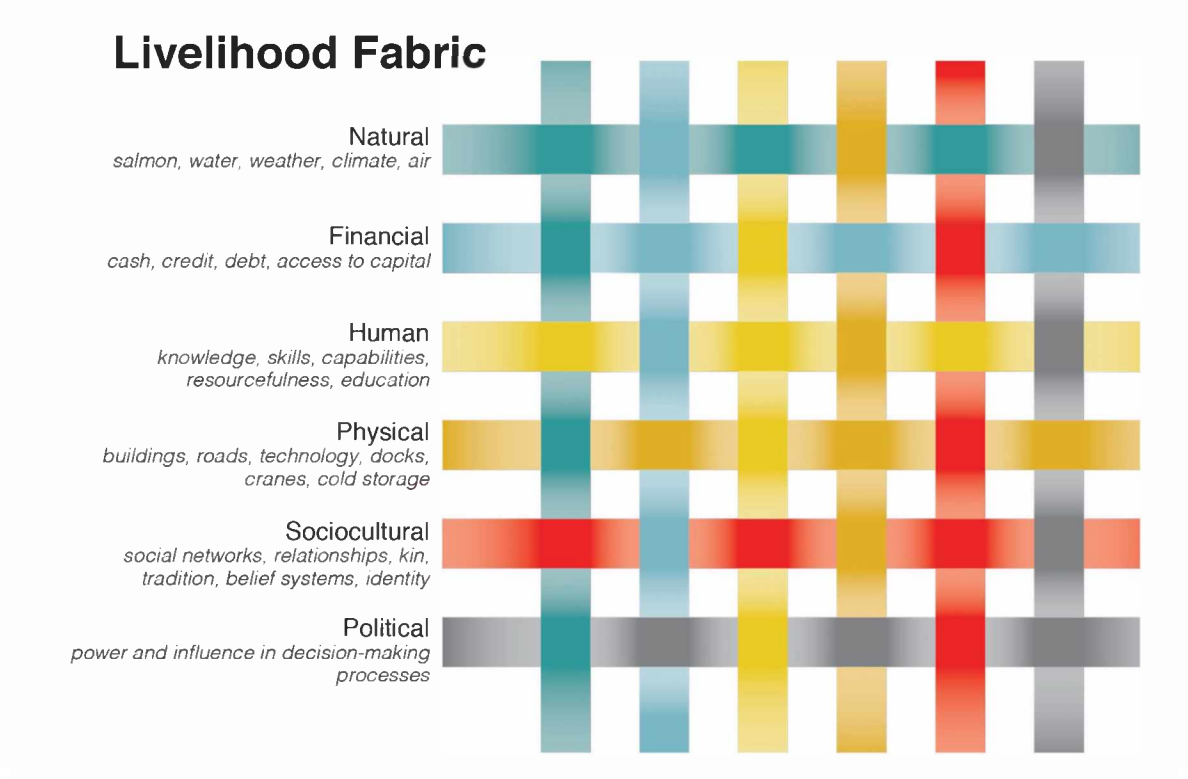

Figure 2.1. Diagram of fishing livelihood fabric concept. Six threads are woven together to form the fabric that supports fishing livelihoods (analogous to Scoones' [1998] livelihood "assets").

2.3. Methods

2.3.1. Study area

The Bristol Bay region is home to the largest run of wild sockeye salmon in the world (Figure 2.2). From 1997-2016, the sockeye salmon run returning to Bristol Bay averaged 34.9 million fish, with the 2018 run exceeding 62 million fish (Alaska Department of Fish and Game 2018a). People and salmon in Bristol Bay are wholly intertwined; the local culture, identity, and economy have evolved from the harvest of salmon for commercial, food and sharing (i.e., "subsistence" in regulatory language), and recreational purposes. Local artwork, celebrations, and ways of interacting with the world are all influenced by the immensely important role that salmon plays in people's lives. A majority of Indigenous people in coastal areas of Bristol Bay are Central Yup'ik. Other cultural groups include Dena'ina Athabascan in the Lake Iliamna and Lake Clark regions, and Unangan (Aleut) and Sugpiaq along the northern and southern coasts of the Alaska Peninsula. Overall, 73% of the Bristol Bay population identifies as Alaska Native alone or in combination with other races (Manson et al. 2018). There are over 10,000 shareholders in the regional Alaska Native Claims Settlement Act corporation, the Bristol Bay Native Corporation (Bristol Bay Native Corporation 2018; Hirschfield 1991). Bristol Bay is part of the Western Alaska Community Development Quota program (CDQ), which was established in 1992 to more equitably redistribute fishery earnings from Bering Sea fisheries to coastal communities in western Alaska within 50 miles of the Bering Sea coast (Haynie 2014). The regional CDQ group is the Bristol Bay Economic Development Corporation (BBEDC). The region encompasses 34 million acres of land owned by the regional Native corporation, village corporations, individuals, companies, the State of Alaska, and the federal government.

Figure 2.2. Map of Bristol Bay region of Alaska. Study communities are shown in red. Indigenous place names are listed first in bold text, and English names are listed below. Indigenous language names and approximate boundaries are shown in white.

2.3.2. Study communities

The four Bristol Bay communities selected for this study include Dillingham, Togiak, Kokhanok, and the Bristol Bay Borough (which includes Naknek, South Naknek, and King Salmon). The western Bristol Bay hub community of Dillingham is home to 2,209 year-round residents, 66% of whom identify as Alaska Native alone or in combination (1.5% Athabascan, 61% Yup'ik, 2.7% Unangan). Located in Dillingham are a regional hospital and most of the region's government services—including the regional Alaska Native corporation and BBEDC offices. Two shore-based fish processing facilities are located in Dillingham, as well as several floating processors and tenders moored seasonally in Nushagak Bay.

The village of Togiak is located approximately 40 air miles west of Dillingham, and has a population of 740, of which 91% identify as Yup'ik. Many Togiak residents participate in the commercial salmon fishery in Togiak Bay (i.e., if a permit holder registers in another fishing district, they may not fish in the Togiak district until July 27). There are two shore-based processing facilities located in Togiak, one privately owned and one owned jointly by Copper River Seafoods and the BBEDC.

Kokhanok is a village of 149 people located on the southeastern shore of Lake Iliamna, roughly 90 miles as the crow flies from the marine coast of eastern Bristol Bay. Ninety-one percent of Kokhanok's residents are Alaska Native, and identify as Dena'ina Athabascan (2%), Yup'ik (1.3%), and/or Unangan (87%). Because of its location, Kokhanok residents are ineligible for most fishery and community development programs offered by BBEDC.

The three communities of the Bristol Bay Borough lie close in proximity, and government services and private businesses are spread amongst the communities and along the 15-mile-long road system. The communities of Naknek (population 509), South Naknek (47), and King Salmon (361) are the east-side home to the lion's share of the bay's commercial fish processing activity, with over a dozen shore-based processing facilities and a busy airport. In 1962, the Bristol Bay Borough was the first borough formed in the State of Alaska, principally for collecting tax revenues from fish processing companies to fund local infrastructure and services (e.g., the Port of Bristol Bay, the Bristol Bay Borough School District, the Kvimarvik Swimming Pool). Fifteen percent, 18.6%, and 2.3% of the Bristol Bay Borough's residents identify as Unangan, Yup'ik, and/or Athabascan, respectively.

2.3.3. Semi-structured ethnographic interview

We used a semi-structured interview format to discuss with participants their perceptions of the fishing industry and entry opportunities and barriers for local youth. Community leaders, elders, and new and veteran fishermen were all selected for interviews based on a snowball sampling scheme in which an interview participant was asked to recommend other participants knowledgeable on the subject. This sampling method, though not statistically representative, ensures that effort is spent gathering information from those knowledgeable about a topic, and is commonly used for sampling cultural data rather individual data (Bernard 2011).

During the interview, each participant went through an informed consent process (UAF Institutional Research Board protocol 555479-10). Interviews were recorded using a digital audio recorder. The interview began by the researcher asking participants to describe their fishing history or experience in their local fishery. A list of additional questions (Appendix A) was used as a guide to the conversation, although participants were allowed and encouraged to discuss topics they were interested in and knowledgeable about (Charmaz 2006). Interviews were 30 to 90 minutes in length, and were generally held in the participant's home, office, or public building (e.g., the local university campus).

Interviews were conducted over the course of multiple trips to each community in 2014 and 2015. The data collection phase was considered complete when interviews reached "saturation"; in other words, when very few new concepts were uncovered by additional interviews (Bernard 2011). Recorded audio was transcribed by project personnel using VLC digital media software and Microsoft Word (Version

16.18, Microsoft Corporation). A small subset of anonymized interviews was transcribed by a transcription service.

2.3.4. Text analysis and grounded theory

Transcribed interviews were inductively coded using Atlas.ti software (Version 8, Scientific Software Development GmbH, Berlin). The researchers first developed a set of meso-scale codes to describe concepts from the interview, and sections of interview text were tagged with the appropriate code or codes (i.e., initial coding; Charmaz 2006). Transcripts were coded by project team members, and intercoder reliability was checked after the initial coding phase. Coders discussed qualitatively their methods for selecting and coding fragments of text to reach consensus on how to code text data uniformly. As the analysis progressed, codes were revised and organized into higher-order categories to highlight the interrelated nature of the codes (concepts), and to develop a theoretical understanding of their meanings and structure (i.e., focused and theoretical coding; Glaser 1978). The emergent codes were ranked in order of frequency across all interviews, and analytical memos were developed for the top 16 codes. Analytical memos served to explore the breadth and depth of the code gleaned from the interview data, and to describe the contexts and relationships between codes. These memos provided the basis for the discussion of livelihood threads, institutions/organizations, and change in the Bristol Bay fishery in this paper.

2.4. Results and Discussion

Guiding questions: 1) what were the kinds of livelihood threads that were most critical during each of three time periods (described below), 2) what kinds of shocks and stresses to livelihood sustainability occurred during each period, 3) how did the resource requirements change within and between periods as a result of the shocks/stresses described?

2.4.1. Rationale for eras

Embedded in these three eras are several distinct time periods, demarcated by significant institutional pressures that have constituted shocks and stresses to fishing livelihoods in the Bristol Bay region. Our goal in grouping time periods is to simplify the narrative and focus on those pressures that shaped each era. To accomplish this, we have grouped time periods in the following manner: "Indigenous" encompasses the livelihoods of Bristol Bay's Indigenous inhabitants prior to Russian and American contact (this does not suggest that Indigenous people and ways of life were unimportant in latter periods); the "Colonial period" includes the period of time from Russian invasion (1741) to Alaska statehood (1959); and the "Modern era" describes contemporary livelihoods from statehood to present. These divisions are not absolute; they are merely approximations of points in time when fishing

livelihoods changed significantly and the balance of different kinds of livelihood threads upon which those livelihoods were created shifted significantly.

2.4.2. Indigenous

Prior to contact with Russians and Euro-Americans in Bristol Bay, Indigenous livelihoods were heavily dependent upon salmon, as well as other animals, plants, and minerals. The Bristol Bay region, including the Iliamna Lake basin, has been occupied for at least 10,000 years, and there is evidence of at least 12,000 years of human-salmon relationships in Alaska (Boraas and Knott 2014; Choy et al. 2016). Human societies in Ice Age Beringia are believed to have developed because of the harvest of salmon (Sutton 2017). Roughly 2,400 years ago, the number and size of coastal villages in Central Yup'ik territory increased rapidly, likely because of technological shifts and development of fishing nets that greatly increased efficiency and volume of salmon harvests (Shaw 1998).

The archaeological record of Dena'ina salmon use is less robust than that of the Yupiit, but the oral traditions of the Dena'ina remove any doubt as to the importance of salmon in the Iliamna Lake and Lake Clark regions (Boraas and Peter 2008). Similar to their Yup'ik neighbors, the Dena'ina relied on salmon and resident fishes, as well as land mammals such as caribou (VanStone and Townsend 1970). However, as nutritionally important as salmon were to early Yup'ik and Dena'ina peoples, they are not extractable from the practices, beliefs, and knowledge borne of living on the lands and waters in the region over thousands of years. Until contact with Russians and Euro-Americans, there was no such thing as a salmon fishery; rather, salmon were seamlessly integrated into a way of life that continues today.

Social ties were critically important in precontact Yup'ik and Dena'ina kin-based societies. Relationships among individuals, families, and communities were and continue to be the basis for fishing livelihoods in Bristol Bay. The existence of strong social ties facilitated practices such as trade, sharing, and cooperative harvests of fish (Boraas and Knott 2014). Relationships with other coastal and upriver communities were critical for ensuring sustainability and resilience of communities; wild foods from upriver villages helped communities in years of poor salmon harvests to ward off starvation (Boraas and Knott 2014). Extensive overseas trade occurred with Russian far eastern societies as well, and brought manufactured goods to the region in advance of contact with Russian and American explorers (Shaw 1998).

Cultural support drawn upon in early fishing livelihoods included gender roles, experiential learning, traditional belief systems centered on a connection to the spirit world (Fienup-Riordan 1995). The division of harvesting and processing labor was based on gender (e.g., men operated fish traps and nets) and age (e.g., family matriarch directed processing of fish, shared knowledge; Fall et al. 2010). Experiential learning was an extremely important practice in precontact Yup'ik culture, as it was believed that knowledge could not be acquired in the abstract (Kawagley 1990; McGrath 2008). Belief systems

also shaped fishing livelihoods in that oral traditions explained the nature of salmon and other living beings, including their personhood, sentience, kinship with humans (Langdon 2006), as well as norms surrounding their harvest and handling and salmon stewardship (Thornton and Scheer 2012).

Knowledge and skill required to harvest, process, and share salmon were deep, broad, and diverse, but in different, more localized ways relative to the human threads of contemporary fishing livelihoods. Skills in the context of fishing were organized by gender, age, and expertise, in much the way they are today (Frink 2009). With respect to knowledge, livelihoods were dependent upon a comprehensive understanding of the plants, animals, climate, weather, geology, and history of the place from which they fed and housed themselves (Braund 2017). For an individual, this living, deeply context-dependent body of knowledge was built over a lifetime and relied on the intergenerational transfer of skills, experience, and gathered wisdom (Holen 2017). Also important to fishing livelihoods were adaptability, development of new technologies and practices, and physical, spiritual, and mental health.

Knowledge, spiritual wellbeing, and social and cultural connections were intimately tied to places on the landscape and the materials it provided (i.e., physical threads). Places were not just physical features from which food and other material elements were drawn (e.g., hills, mountains, river valleys, rock outcroppings, beaches); rather they were and are landscapes embedded with culturally significant meanings, stories, and identities (Lewicka 2011; Lyons 2015). Physical implements and structures were made of locally sourced, renewable, materials that required much in the way of knowledge and skill to produce and maintain. Much of this infrastructure was food-centric, including boats, kayaks, and dogsleds for traveling to and from fishing sites; cutting tools, drying racks, and smokehouses for processing fish; and grass baskets, caches, and cold storage pits for storing salmon (Boraas and Knott 2014).

The salmon themselves were foundational to Indigenous livelihoods. Because of their importance to all other aspects of life, variability in salmon abundance from year to year constituted significant acute shocks and/or prolonged stressors to Indigenous fishing livelihoods. Examples include periodic famines due to poor fish returns or other animal and plant shortages, extremely warm or cold winters that prevented hunting for long periods, gathering wood for fuel and heat, and wet and warm summers that made drying and preserving of fish and meat difficult. However, people had adapted their practices, social structure, and even their bodies to tolerate the kinds of shocks and stresses presented by natural resource failures or harsh weather conditions (Bersamin et al. 2007; Loring and Gerlach 2009). This is in stark contrast to the kinds of shocks and stresses that were to follow contact with Russian and American colonists.

Power and influence in Yup'ik societies were determined by experience and wisdom acquired, and ability to provide (e.g., *nukalpiaq* is 'good provider' in Yup'ik). Dena'ina clans were led by a *qeshqa* chief and *nakilaqa* clan helpers, who distributed food among members and built partnerships with other clans

(Boraas and Leggett 2013). Elders of both groups have been revered for their knowledge and experience. On a regional level, Native nations or clans were distinct and politically autonomous, occasionally engaging in violent conflict with one another (Black 1984). More often, trade alliances and intermarriage between villages or clans solidified relations and resulted in a relatively stable distribution of power across the region (Boraas and Leggett 2013). However, what is important to note in the context of fishing livelihoods and political power is that with Russian contact and rule in the region, the Yup'ik and Dena'ina were no longer fully sovereign peoples, and they would never be again. The significance of that loss of self-determination and ability to make decisions for their people is not to be underestimated as a shock and a stressor that have shaped fishing livelihoods for many subsequent generations (McGregor 2004).

2.4.3. Colonial period

The colonization of Alaska by Russia and the United States constituted multiple shocks to Yup'ik and Dena'ina peoples in Bristol Bay, affecting every livelihood resource to varying degrees (Black 1984). Arguably the most severe shocks and persistent stresses were experienced through the disruption of social ties and cultural traditions. Boraas and Knott (2014) use the term *anomie* to describe "the loss of meaningfulness, sense of belonging, and direction in life", in essence the tearing of the social fabric by Westernization of Indigenous cultures (Merton 1938). Belief systems (e.g., *Yuuyaraq*) were abolished or at least significantly augmented by the church. Christianity was adopted to varying degrees after the Great Death, and survivors and their descendants practiced *nallunguaq*, or pretending it—the immense loss of life, the social upheaval, and the communal depression and destructive coping mechanisms that followed—never happened (Napoleon 1996). For over 200 years, aspects of human wellbeing such as individual and community physical and mental health have continued to suffer negative repercussions of Russian and American colonization (Salzman and Halloran 2004).

Indigenous health and wellness were further threatened as a result of epidemics introduced by Russian and American explorers. The Great Death (*quserpaq)* killed large proportions of Alaska Native villages in the region, and the survivors were left to resettle in other villages and to make sense of the loss of not only their loved ones, but their social ties and belief system (Napoleon 1996). There was a sense among the survivors that the devastation of the epidemics was in some way their fault; that perhaps they were being punished for their old belief systems or ways of life (Boraas and Leggett 2013). This sense of guilt and shame was reinforced by the centuries of institutionalized racism that colonialism brought. The impacts of these epidemics were felt by the generation that survived them, and also by their descendants in the form of multigenerational trauma that presents as substance abuse, violence, sexual assault, depression, and suicide (Napoleon 1996; Palinkas 1987). Similarly, the American colonial practice of abducting Indigenous children and forcing them to attend distant boarding schools or local mission

schools severed early ties to their language, culture, and kin (Pullar 1992). This shock also affected the development of human threads in that it redefined which skills and what kinds of knowledge were deemed to be important or necessary (i.e., the names of past US Presidents versus the relationships between the weather patterns and the arrival of salmon in the river mouth) and for what purpose (i.e., being 'civilized' versus living off the land).

Prior to colonization, daily life in Bristol Bay was governed from within by individuals and families that held high status in the community. After contact, these community and family structures were upended and social hierarchies in Yup'ik and Dena'ina societies were dismantled to accommodate outside and often distant authority of churches and states (Burch 1994). The shift in power away from Indigenous communities to colonists had and continues to have repercussive effects on all other aspects of fishing livelihoods. The first wave of colonization in the region by the Russian-American company, beginning in about 1818, came about because Bristol Bay was a point from which to access interior and upriver Kuskokwim trading opportunities to supply the overseas demand for furs (VanStone 1967). The region's other natural resources—minerals, salmon, game, timber—were of lesser interest to Russian colonists. With the sale of Alaska's sovereignty to the United States in 1867 came an abrupt shift in the motivation for outsiders to colonize the Bristol Bay region.

Less than 20 years after Alaska became a territory of the United States, the first salmon cannery in this region was established in 1884 in the Yup'ik village of Kanulik, on the eastern shore of Nushagak Bay, five miles from present-day Dillingham (Branson 2009). The waning decades of the 19th century marked the industrialization of salmon fishing in Bristol Bay, and the erosion of sovereignty that local and Indigenous people had over the harvest of salmon in the region. From this point on, fishing livelihoods were bound by the regulations set by the federal government (e.g., the White Act, which was based on laws already in place on the Columbia River basin), both indirectly through the influence of the canneries on federal management and directly by cannery operations and policies on the day-to-day functioning of the local communities (Cooley 1963).

Prior to the passage of the White Act of 1924, the timing and size of the salmon harvest and means and methods employed to catch fish were controlled by the canning industry (Schelle et al. 2004). The use of fish traps, though they were not well suited for the muddy substrates and massive tides in Nushagak and Kvichak bays (VanStone 1967), prevented salmon from reaching their spawning grounds, and in turn threatened natural and sociocultural resources and the sustainability of fishing livelihoods in coastal and upriver communities (Branson 2009). In other parts of Alaska, the White Act lead to significant changes in the way the fisheries were prosecuted (e.g., fish traps outlawed, minimum 50% escapement required in spawning streams). In Bristol Bay, however, the canneries successfully included language in the White Act prohibiting power boats in the Bristol Bay Management Area, which remained in effect until 1951

(Tussing et al. 1972). This limitation on the physical resources available to fishermen served to keep control of the fleet in the hands of the canneries.

Initially, commercial harvests had negative impacts on the abundance of salmon (Schelle et al. 2004). At the time, fishery managers did not have the knowledge or manpower required to set or enforce sustainable escapement goals (Arnold 2009):

> My father along with other people was very active in fisheries politics. Bristol Bay used to be controlled by [Wynn] Brindle which was a big cannery superintendent and what he said was law of the land. Fish and game used to listen to those big processors. (Interview in Boraas and Knott 2014)

As the Bristol Bay commercial salmon fishery developed, substantial efforts were made to balance the immense power held by the canneries. Fishing and cannery workers' unions formed early in the early 1900s, and were an important force of resistance against the cannery (and competing union) control over individual fishermen's livelihoods (Hughes 1982). A prominent example of resistance in the commercial fishery was the 1951 fishermen's strike to protest the disparate treatment of Alaskans and nonresidents by the canneries:

> While nonresident employees have decent housing, fuel, lights and other advantages of civilization incidental to their employment, residents often have to live under conditions even worse than many farmers raise their livestock in the states...On the other hand, non-residents have bedding furnished, janitor service, adequate and proper meals...all conditions of employment residents do not now or have in the past enjoyed. (Bowman 1951)

This discriminatory treatment by the canneries extended to community residents as well. Payment for work done at the cannery was made in tokens to be spent at the company store, rather than cash (Reedy-Maschner 2007). For better or for worse, the canneries were typically one of few suppliers of goods and cash income in the community, but made little to no attempt to hire local Alaska Natives, favoring instead Chinese contract labor, then Filipino and Mexican workers (VanStone 1967).

The balance of power between canneries, fishermen, and local residents in Bristol Bay contrasted that found elsewhere in Alaska. For example, Native fishermen in Southeast Alaska regularly protested and secured decent wages—though still significantly less than Euroamerican fishermen—in response to the unfair labor practices of canneries (Arnold 2009). A key difference in the cannery-fisherman dynamic in Bristol Bay and in other regions of the state is that the fishermen in Southeast and Cook Inlet were generally not reliant on the cannery for boats, gear, food, or lodging, and were thus in a better position to leave a cannery that was not meeting their needs or paying fair prices for their fish (McCullough 2001). The reasons for the outsized influence of the canneries in Bristol Bay relative to Southeast and Cook Inlet during its development included Bristol Bay's geographic isolation from market centers and sailing routes, and the nonlocal character of the fishery (Crutchfield and Pontecorvo 1969). In effect, locals were kept from participating in the fishery in favor of cannery bosses, fish processors, and fishermen imported from the Lower 48 states and elsewhere.

Economic changes imposed significant shifts in the sociocultural, political, human, and physical elements of fishing livelihoods; there was money to be made in Bristol Bay whether from furs (Russian colonization) or salmon and minerals (American colonization). A shift occurred from living off the land into wage work and participation in the global cash economy as salmon fishing became increasingly industrialized in the wake of the Industrial Revolution and World War II. Kinship, reciprocity, and sharing were no longer the only foundation of economic transactions in the region; commodity markets and profit seeking also drove decision making in the post-contact salmon fishery. Positions of economic power were redefined as well by the role of the canneries in the fishery and in daily life: "the process of using village providers to convert the population into loyal company men and women to recruit fellow villagers into exploiting and extracting the resources of their own region for external benefit in a colonialist economic system has not changed in over a hundred years" (Boraas and Knott 2014: 34-35). As federal, state, and tribal government and non-fishery industrial presence grew in Bristol Bay communities (e.g., Kanakanak Hospital, US Fish and Wildlife Service, Alaska Department of Fish and Game, Bristol Bay Telephone Cooperative) year-round wage work began to compete with and in some cases, supplant fishing work.

Fishing livelihoods were further reshaped by rapid changes in technology and infrastructure during the late US colonial period, including the advent of power boats, two-way radio communication, snowmachines, telephones, electricity, roads and transportation, and television and radio service (Moore 1995). These physical changes translated into social and cultural changes as well, in the form of connections to the world outside the Bristol Bay region. In particular, the change from cannery-owned double-ender sailboats to independently owned power boats remains a symbol of fishermen wresting some level of control away from the canneries, although it also meant that canneries no longer had to bear the burden of maintaining a fleet of fishing boats, and could still dictate many aspects of a fisherman's operation (Troll 2011). Key changes to the physical resources available to fishermen and local residents in the region during the post-WWII era included electrification and widespread availability of refrigeration (Rogers 1979). This change marked a shift in the processing and preservation of salmon, and the first of several subsequent commercial salmon quality improvements by marking the transition from canned to frozen salmon products. Transportation advances, including new and better roads and regular air service to regional hubs of Dillingham and King Salmon, also changed the nature of fishing livelihoods by increasing access to outside goods and decreasing the time and cost of exporting commercially harvested salmon. People began to be able to leave more often and were exposed to parts of Alaska and the world that they had only been previously with great cost and effort.

The fishing knowledge, practice, and skills held by the local Yup'ik and Dena'ina people in Bristol Bay were willfully shunned by the cannery bosses in the early commercial fishery period. The prejudiced

treatment of people of a particular skin tone or ethnic background, and the unjust use of their labor for economic gain by a powerful minority is a hallmark of colonialism everywhere (Mann 2011). The discriminatory hiring practices by Bristol Bay canneries that favored Euroamerican fishermen and Chinese cannery workers over local whites and Alaska Natives, which virtually excluded the latter from the commercial fishing industry for 70 years, were unjust but unexceptional (VanStone 1967). The first and second world wars kept many of the regular nonlocal fishermen from fishing in Bristol Bay, and so local Native and non-Native people stepped into the roles of fisherman and cannery worker beginning in the mid-1940s (Troll 2011). As postwar economies grew and Alaska progressed towards statehood, the dependence on wage work in Bristol Bay also grew. This brought an increased need for specialized skills, in addition to the suite of generalist skills and self-reliance that made life in rural fishing communities possible (Hébert and Mincyte 2014).

2.4.4. Modern era

The modern era began roughly when Alaska transitioned from a US territory to a state in 1959. The key economic, sociocultural, and political resource shifts that occurred during this period brought about further shocks and stresses to fishing livelihood resources in Bristol Bay. These shocks and stresses, which are described below, broadly relate to the privatization of fishery access and knock-on effects on entry and participation by local fishermen (Carothers 2010; Longo et al. 2015; Ringer et al. 2018). Further, the stresses resulting from changes imposed during the colonial era continued to have downstream multigenerational impacts on resources and livelihoods in the modern era. These effects, and related themes, form the core of this ethnographic research effort. The fishermen, community leaders, and community members that were interviewed for this project ranged in age and experience from those able to remember the sailboat days to those barely old enough to remember the run failures that occurred in 1997. For this reason, much of the livelihood change during the modern era that will be described below will be supported by the grounded theory and interview data described in the methods section. The themes that emerged from this work were varied and numerous; in the following discussion we will focus on stories of change and the forces that people perceived to be responsible for those changes.

The shift from territory to statehood was a hugely important moment in Alaska's political history. Although Alaska gained significant political advantages with statehood in relation to the powers in Seattle and Washington D.C., it was by no means the end of colonialism and injustice in its management of natural resources. Alaska was now in a position to manage its resources in the best interest of its residents rather than for outside interests. However, outside influences such as the seafood processing industry and the federal government all continued to shape the inputs and outcomes, as well as the form and function, of Alaska's salmon management paradigm (Tussing et al. 1972). The Board of Game and Fisheries (which later became two separate boards) was established to design and implement regulations setting the harvest

limits, means, and methods for harvesting wildlife based on proposals from the public. Like many bureaucratic entities before and after it, however, its participatory processes were not familiar or accessible to rural fishermen unaccustomed to filing paperwork and traveling to Anchorage to have their voices heard for three minutes by an unfamiliar appointed committee. In a move to reclaim economic and political power, in 1962 the communities of Naknek, South Naknek, and King Salmon formed a borough (i.e., county) to tax local canneries and address community needs.

Interviewees spoke of the years immediately following statehood, in which many families had already settled in town and taken full-time jobs at the hospital, schools, with the government, or elsewhere. One interviewee remembered being one of the last families to stop migrating seasonally to harvest fish in the summer, caribou, moose, and birds in the fall, and trap in the winter. These stories about changing livelihood strategies paralleled the transition from customary trade and barter of wild resources to a mostly cash economy, which had been building in the region for nearly 80 years by that point (Palinkas 1987). As of the early 1960s, many significant changes had taken shape in the fishery and the communities in the region, but the predictable and abundant runs of salmon declined, after a prolonged stretch of highly variable returns, under the weight of commercial fishing pressure and cooler ocean temperatures. These two factors combined spurred fishermen and canneries to muster the political will to change the way the fishery was managed. After failed attempts by Alaska voters to modify the state constitution to allow for enclosure of publicly held fishery resources, a third referendum passed, setting the wheels in motion for a new paradigm in Alaska's fisheries.

Arguably the most significant shift in political resources that affected fishing livelihoods in Bristol Bay and across the state was the passage of the Limited Entry Act in 1973. The act served to fix the number of vessels in each fishery by allocating permanent, transferable rights to those individuals[4] that met specific economic hardship and historical participation criteria (Tussing et al. 1972). However, these criteria—well-meaning though they were—and the implementation of the allocation process severely disadvantaged rural and Alaska Native fishermen relative to their white and urban counterparts (Carothers 2010; Koslow 1982; Petterson 1983). Reasons for this disparity included first and foremost a worldview held by Yup'ik and Dena'ina fishermen that fundamentally did not recognize the right to fish as a tradeable commodity, but instead as a privilege exercised since time immemorial and bestowed by the Creator, contingent upon kinship with and respect for salmon (Fall et al. 2010). Further, many Alaska Native fishermen, particularly older adults, did not speak English as a first language, and by the 1970s had only begun to exist in a Western paperwork-centric world. Thus, many permit applications either went in the trash or were filled out incorrectly:

[4] Only natural persons are able to hold fishing rights; this rule was an important feature of the Limited Entry program and was meant to preserve the owner-operator character of the state's fisheries.

> You know, a lot of people didn't speak English; English was a second language, so they sued and won, and there [were]… interim permits issued to rectify that…[the paperwork was] nowhere near accessible. If you didn't know how to exist in a Western paperwork world, you missed out. (Dillingham setnet fisherman, 2 October 2014)

The allocation process is a key example of the ways in which fisheries policy valued institutional knowledge and bureaucratic skills for functioning in the global economy and American cultures over the intergenerational transfer of locally based, traditional fishing knowledge and skills that underlie the way of life in rural fishing communities (Kamali 1984). Because the paperwork was burdensome and inaccessible to many livelihood fishermen, the eventual outcomes of the allocation process were, and continue today to be, devastating for rural, fishing-centered communities in Bristol Bay. As fishermen and communities were dispossessed of their fishing rights through forfeiture, sale to nonlocal fishermen, and other barriers to permit ownership, so too were they dispossessed of any power (i.e., political resources) they had previously held to influence how their fishing livelihoods would be sustained under the limited entry system.

With the onset of limited entry, fish prices in Bristol Bay ballooned and outside fishermen took notice. Returns of salmon also increased, owing to a warm-phase shift in the Pacific Decadal Oscillation in 1977 (i.e., fish grow larger and more abundant in positive PDO phases; Mantua et al. 1997). After the Boldt Decision[5] displaced many white fishermen from the commercial salmon fishery in Puget Sound in the early 1970s, they began to look for other fishing opportunities where fishing rights were still relatively affordable (Adasiak 1979). The Bristol Bay salmon fisheries offered just such an opportunity and lasted only three to four weeks, making them a perfect fit for fishermen that traveled from outside the region to fish, or those that had full-time jobs aside from fishing:

> Most of the people who fish already either, number one, have money, or number two, the summer season in Naknek is just their off-time and they're spending their off-time fishing...That's their vacation. Believe me, I've talked with a lot of people, wondering where they come from, what they do. There's [sic] a lot of doctors, there's a lot of lawyers, timber people, apple farmers… (Kokhanok setnet fisherman, 26 February 2015)

The trend of fishermen from elsewhere in Alaska or the Lower 48 purchasing fishing rights from local residents began in the drift gillnet fishery, but has become increasingly common in the set gillnet fishery as well.

Cash—specifically, large amounts of cash—became a hugely important to fishing livelihoods after limited entry; never before were the initial cash requirements of participating in the fishery so

[5] In 1855, Washington Governor Isaac Stevens signed a treaty with Western Washington tribes that codified the latter's right to take salmon wherever they had traditionally been taken (with the exception of shellfish beds cultivated by whites; Treaty of Point Elliot, Article VII; Brown 1994). The 1974 Boldt Decision, resulting from the US government suing the State of Washington for infringement of treaty rights, allocated 50% of salmon harvests to Indigenous fishermen. This landmark decision, although it represented a long-overdue recognition of Indigenous fishery rights in the United States, created the knock-on effect of displaced Washington fishermen pursuing Bristol Bay salmon fisheries.

insurmountable. Prior to 1975, access to the fishery was free, other than the purchase of a $75 gear license. After limited entry, the cash value of access rights in the form of the limited entry permit quickly reached over $100,000 (Commercial Fisheries Entry Commission 2018). Windfall gains, such as a $100,000 fishing permit, were frequently cashed out in times of acute financial need:

> Since limited entry came, [families] were forced to either sell their permit just to buy food and [heating fuel] at the high price, or go without food so what did they do? They sold their limited entry permits after limited entry program started. (Naknek drift fisherman, 25 September 2015)

Ironically, the sudden wealth represented by fishing access rights often lead to temporary economic gains but significant long-lasting social, cultural, and human resource losses (e.g., identity, practice, downstream knowledge, tradition, skill).

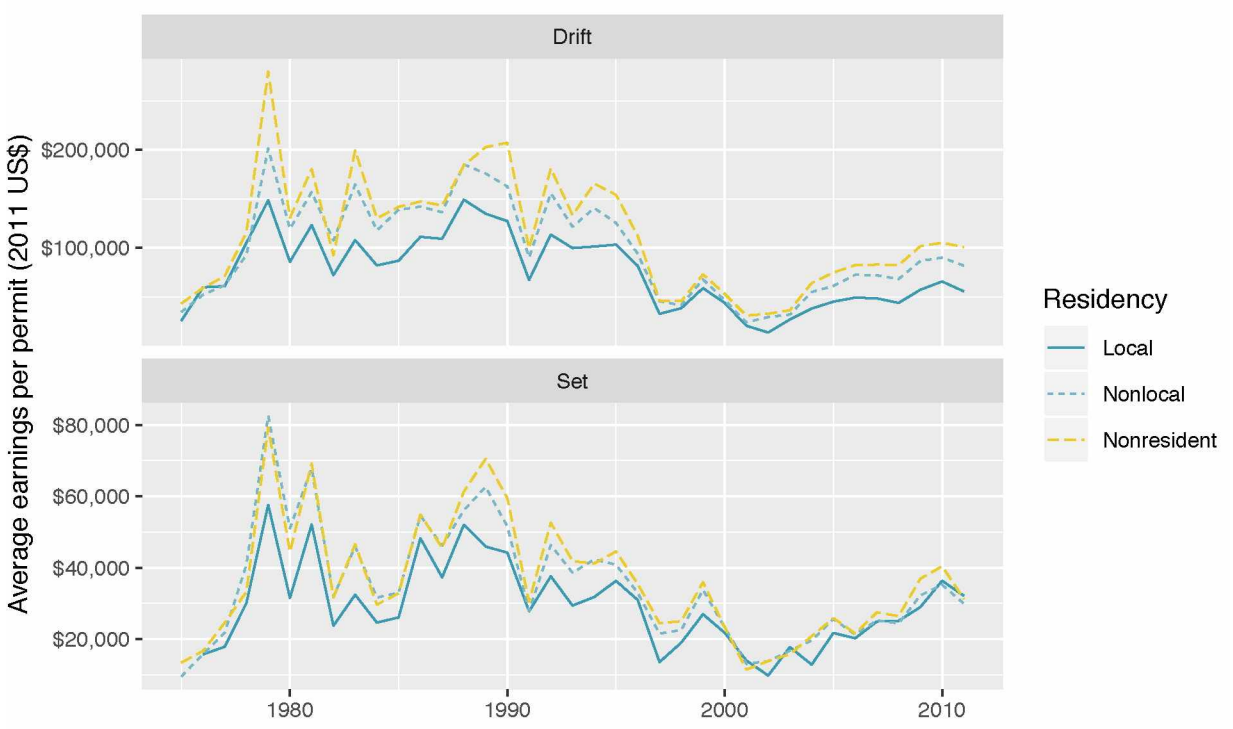

Figure 2.3. Average earnings per permit fished for local, nonlocal, and nonresident fishermen in the Bristol Bay drift and set gillnet fisheries. Bristol Bay residents (locals), residents from other Alaskan communities (nonlocals), and residents of other US states (nonresidents) are represented. Earnings adjusted using the 2011 Consumer Price Index (Shriver 2012).

As the regional economy shifted towards cash, goods imported from the Lower 48 grew in demand. Appliances, snow machines, outboard motors, clothing, and food were available in Bristol Bay communities but were much more expensive than in Anchorage or Seattle. The high cost of living is a stressor that is particular to rural Alaskan residents, since nonlocal urban residents and nonresidents return to their communities after fishing, where the cost of living tends to be lower. Heating fuel, boat parts,

other gear, and food takes a proportionally larger share of a rural fisherman's gross fishery earnings than a nonlocal's, in addition to local fishermen earning less on average from fishing than nonlocals (Figure 2.3).

Also during the late 1970s, foreign fleets were banned from high-seas interception of Bristol Bay salmon, and so there was an increasing reliance on the Bristol Bay canneries to produce sockeye salmon products demanded by Japanese markets (Sathre 1986). This began a period of joint-venture operations between Seattle-based American canning companies and large, vertically integrated Japanese food conglomerates. A common practice involved one company purchasing another to shutter its plant and reduce competition (Hébert 2008):

> Yeah, we used to have many more canneries operating in Bristol Bay. We had floaters that came in, cash buyers—they've gone away. There's been a lot of consolidation. Trident Seafoods has bought up a lot of the cannery real estate, and once they buy a cannery, they usually shut it down and consolidate their operations. (Dillingham drift fisherman, 22 September 2015)

Consolidation in the processing sector had the effect of shrinking the number of competitive buyers, thus disempowering individual fishermen in their attempts to seek better business arrangements with other companies (e.g., selling to a cash buyer). For fishermen, there continues to be very few alternative options for selling their catch. When limited entry was being considered in the 1970s, "salmon processors still maintained a significant hold over individual fishermen, both through credit and financing arrangements and through the untrammeled power to decide whether a fisherman would fish for a particular company" (Adasiak 1979). Interviewees spoke of fishing and behaving in ways that would not draw negative attention from the fleet manager at their processing company, while being "put on limit" (i.e., restricted from fishing), fully aware of the double standard at play in the fisherman-processor relationship and the difficulties it created for fishing livelihoods.

By the 1980s—100 years since the commercial fishery began—very little had changed in terms of the power imbalance between the canneries and fishermen. Strong salmon markets during this time brought floating processors and cash buyers to the bay that offered higher exvessel prices and that drew fishermen away from shorebased canneries. However, for the better part of three decades, fishermen had suspected that the canning companies colluded with one another to set a single, noncompetitive price, rather than offer competitive prices. This was because prices would be announced by all companies on or around the same day, and this price was often not confirmed until the season was over (i.e., post-season "adjustments" to the offered price were frequently made):

> [That] was my only really big problem is I never knew what the price was … you don't know what you're making that day. You know, that just always bugged me … I could never work a [shorebased] job and not know how much I'm going to get paid. (Naknek drift fisherman, 10 May 2015)

> The state's tried in the past to make [the processors] set a price before you go fishing. Well, that backfired because they just put down ten cents a pound. You still don't know what you're going to get. (Dillingham drift fisherman, 23 September 2015)

In 1991, the tension between the canneries and fishermen bubbled over when canneries offered $0.47 per pound, down from over $1 per pound the previous year (United Press International 1991). Fishermen took to the picket lines beginning June 25, and local offices and businesses closed in solidarity. The canneries argued that the market was saturated, rationalizing the $0.47 per pound price, but the fishermen believed that the Japanese parent companies of many of the large Bristol Bay processors were intentionally keeping prices low, even though the consumer price of wild-caught salmon remained unchanged. The fishermen and canneries resolved the dispute after one day, with the price set at $0.70 per pound. The resolution, however, was not perceived as a victory for Bristol Bay fishermen. Resentment towards those who broke the strike lingered, and no significant changes in the way the processors treated their fishermen ever materialized:

> I think what has changed is, is the idea that we have a say in this whole thing. We don't. It's a market-driven fishery. I have no say in what I'm getting paid. I can't choose what company I'm fishing for because I'm stuck with [the company I have], if I move anywhere else, who's gonna take my fish? (Dillingham drift fisherman, 26 September 2015)

2.4.5. The Disaster Years

> In 1988 the price of oil was at $10 a barrel I believe, and the price of fish went to $2.40 a pound. I honestly didn't—at the age of 23 I didn't know what the heck I was doing. I was fishing for Drag Net Fisheries, they were offering $2.15 a pound, the cash buyers were offering $2.45 and after three deliveries to a cash buyer I had $100,000 … under my bunk in my boat, literally. (Dillingham drift fisherman, 26 September 2015)

A dozen years after the record high exvessel price of $4.31 per pound (in 2018 dollars), competition from farmed salmon brought devastating effects on fish prices, which remained low through the mid-2000s (Figure 2.4; Steiner et al. 2011). This shock had the effect of making fishing livelihoods economically unsustainable during this period (Carlson 2002), and also created pressure on sociocultural livelihood resources (Donkersloot 2005; Donkersloot 2007). Several interviewees discussed this time as one of uncertainty and needing additional resources to fall back on, like outside employment or selling rights to make ends meet (i.e., choosing another livelihood strategy that may not include fishing). This loss of connection to the fishery through sale of a permit distanced individuals and families from the fishery and weakened individual and community fishing identities.

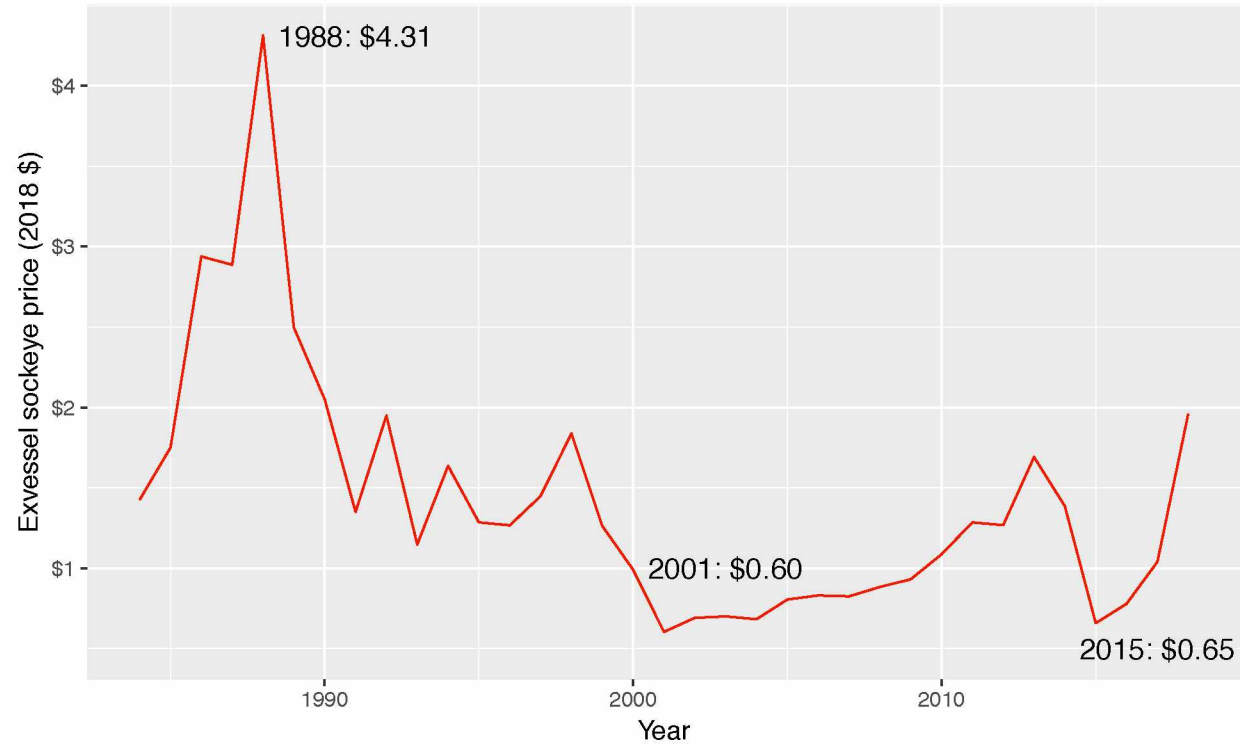

Figure 2.4. Average Bristol Bay exvessel sockeye salmon price adjusted for inflation, 1984 to 2018 (Alaska Department of Fish and Game 2018b).

Simultaneous to the collapse of salmon prices, the 2000s brought significant technological changes in the form of satellite television, computers, internet, and mobile phone capacity to Bristol Bay. These new technologies spurred sociocultural changes already in progress as a result of the rapid electrification and telecommunications systems established in the 1950s and 1960s. As Bay residents—particularly youth—became increasingly connected to the outside world, the possibilities for work, education, and life experiences were greatly expanded. Combined with the uncertainty brought about by the run failures and price crashes during this period, sociocultural shifts meant that what was once taken for granted—that one's livelihood would in some way be connected to salmon fishing—was now just one of many livelihood options.

Poor salmon prices pushed families to seek livelihood opportunities outside of fishing, but changing social and cultural expectations in the 1990s and 2000s pushed rural youth to extend their education beyond high school. It is certainly possible that around dinner tables during the disaster years, these conversations overlapped. One interview participant suggested that while parents struggled to make a living from the fishery, children were either explicitly or implicitly told that they could always fish but should have a career first to avoid the risk and uncertainty associated with a fishing livelihood. The impact of this advice has rippled through fishing communities, which have seen fewer and fewer young residents—especially young women—return and settle in their hometowns (Donkersloot 2007; Hamilton

and Seyfrit 1993). The linkages between people, the community, the culture and the livelihood of fishing have been changed by the combination of leaving home for college and the uncertainty of fishing careers, as described by an interview participant:

> I was sent away for private school in Seattle and I was glad for the people who had enough vision in me. But I when looked over my shoulder when I left that bay, my culture was gone. That could've happened to a lot of other people too. Fortunately I came back with my wife. And we lived in the villages, and I got my dog team back and killed a moose every month. Did the things I always did before—trapped. That type of thing. Fished. But so many of our young people—once high school started and universities come about—they're just not a part of this culture anymore. That's okay, if that's what they want. I didn't want it to go away. (Naknek drift fisherman/community leader, September 25, 2015)

In a display of resilience, adaptation, and determination, fishermen and processors climbed out of the price slump by restructuring their operations and by improving the value of their catch. Fishermen restructured their operations by investing in larger and faster fishing vessels and hiring larger crews to harvest more fish (but at greater cost), and in some cases by establishing cooperative fishing operations to fish multiple sites and to quickly direct crew labor where it was needed most (Donkersloot et al. 2018). Fishermen and processors worked to increase exvessel and wholesale fish prices through developments in product quality (e.g., chilling and bleeding fish), by shifting from canned products to flash-frozen fillets, and by increasing custom processing and direct marketing efforts to access boutique and niche markets. Although these economic shifts had significant financial benefits for the commercial fishery and the communities, they continued to transform commercial fishing livelihoods into profit-maximization ventures from the multipurpose, adaptable, and culturally embedded set of practices and norms they had been before privatization.

2.4.6. Today

After the disaster years, fish prices rebounded somewhat but for most Bristol Bay residents, the damage had already been done. Many local fishermen moved from Bristol Bay between 1995 and 2010, although the regional population continued to grow through the 2000s (Figure 2.5). Many others held onto their permits and weathered the storm (setnetters more so than drifters), and some, mostly nonresidents and urban Alaskans, used the opportunity to purchase fishing rights in the drift fishery. The impacts of the disaster years—shaken confidence in the persistence of fishing livelihoods in the face of biological and economic change, feelings of disempowerment created by cannery control, outmigration of people and fishing rights out of state and to urban centers, and lost connections to fishing—were compounded by the constraints placed on fishing livelihoods by the limited entry system. Not fishing during the disaster years was not an option for those fishermen with debt obligations (i.e., permit loans),

unless they sold their fishing rights altogether. The legacies of the disaster years continue to reshape the way that life in the Bristol Bay region is lived.

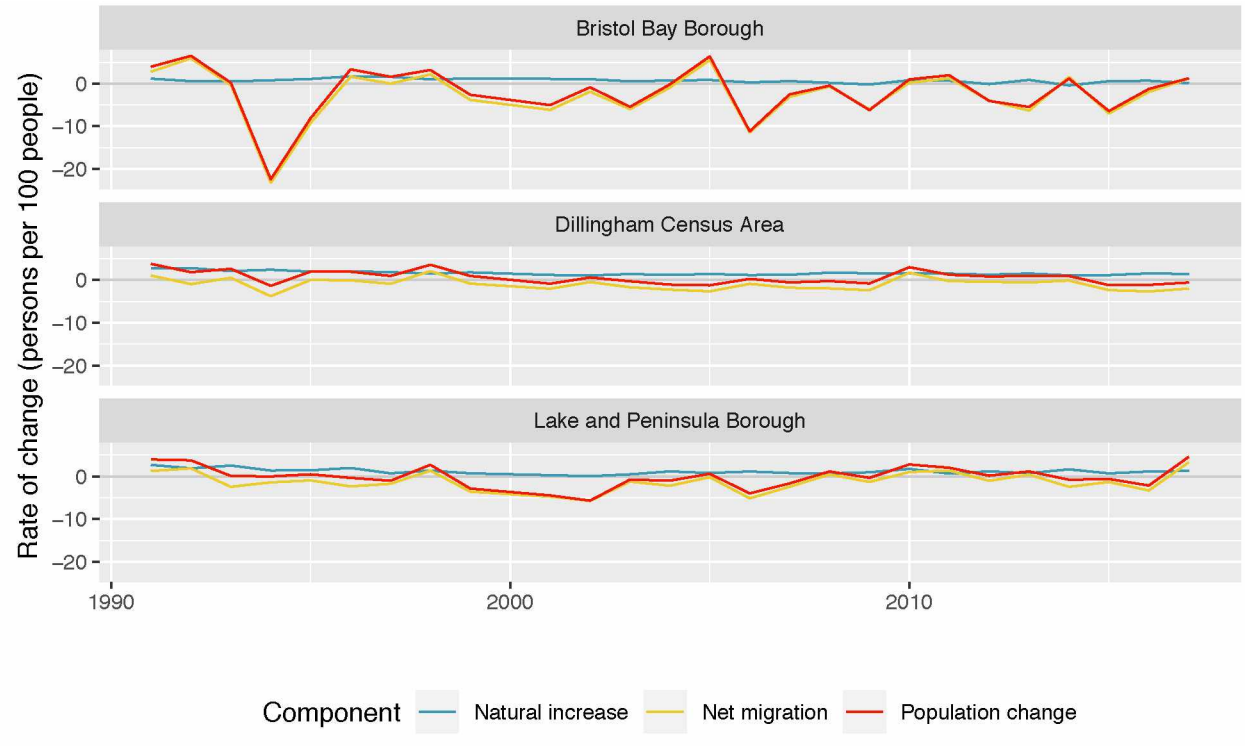

Figure 2.5. Components of population change for the Bristol Bay region (including the Bristol Bay Borough, Dillingham Census Area, and Lake and Peninsula Borough) from 1990 to 2017. Natural increase refers to the net total number of births (positive) and deaths (negative), while net migration refers to the net total number of people moving to (positive) and from (negative) the borough or census area. Population change is the sum of natural increase and net migration. Measurement period is from July in any year to July in the following year (Alaska Department of Labor and Workforce Development 2019).

Outmigration of fishing rights is the one of the most significant challenges facing the fishing communities of Bristol Bay (Apgar-Kurtz 2015; Ruby and Heyano 2016); however, this shift is not unrelated to the numerous pressures created by colonization, industrialization of the fishery, and the privatization of fishing rights. For Alaska Native fishermen, the legacies of forced acculturation, discrimination in the commercial fishery, and a governance system that fails to recognize their tens of thousands of years of salmon stewardship in favor of economic efficiency and individual opportunity all contribute to the deterioration of fishing livelihoods. Among rural fishermen more generally, the loss of local fishing rights is not unique to Bristol Bay, although outmigration rates there are among the highest in the state. Between 1976 and 2016, 52% of locally held drift and set gillnet permits outmigrated, were transferred to nonlocal permit holders or cancelled, compared with 30% of locally held permits in all

salmon fisheries[6] (Gho and Farrington 2017). These statistics are well understood among local residents, and there has been a shift towards "keeping permits local", yet some interviewees questioned whether people's actions match their attitude in this respect. In other words, a permit holder may want to keep a permit in the region but may actually sell to a nonlocal buyer for financial or other reasons.

> There's a local guy...he just sold to somebody—he tried to hold on to the permit to give the sale to his nephew, but … [getting a loan] was taking too long so his uncle said 'I gotta get rid of it'. (Naknek setnet fisherman, 26 February 2015)

Local permit holdings also decreased as permit holders moved out of the Bristol Bay region (Figure 2.6). A holistic assessment of emigration from Bristol Bay, and from rural communities in Alaska in general, is beyond the scope of this study, but the movement of people spurred by the privatization of access rights is felt by communities. In interviews with Bay residents, connections to the land, close-knit communities, family, self-sufficiency, and peacefulness were oft-cited reasons for wanting to stay in the community. Lower costs of living, availability of full-time jobs, and educational opportunities for young children were reasons given for moving to urban centers in Alaska or elsewhere. However, interviewees repeated the sentiment that most people move because they don't feel they are able to stay and live the life that they want for themselves and their families—lives that until recently were built principally around salmon. The influence of state-, national-, and global-scale sociocultural, economic, and historical factors in creating the conditions that challenge salmon livelihoods in Bristol Bay is often ignored in favor of simpler explanations for rural-urban migration (e.g., people don't want to live in rural communities anymore). However, there is no single cause for the movement of people and fishing permits from Bristol Bay communities, and so the trend persists despite local- and state-level efforts to reverse it.

[6] Excluding statewide salmon hand and power troll permits

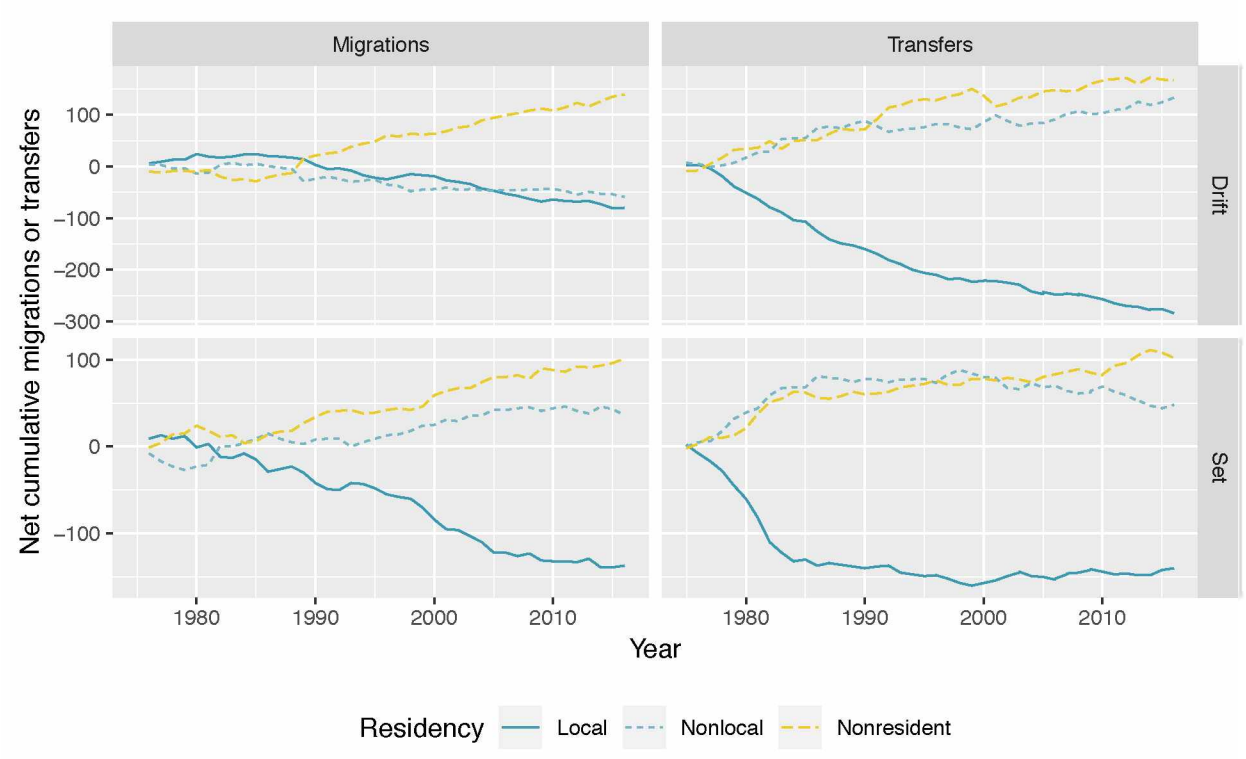

Figure 2.6. Net cumulative permit migrations and transfers by residency category for drift and set gillnet fisheries. Bristol Bay residents (locals), residents from other Alaskan communities (nonlocals), and residents of other US states (nonresidents) are represented (Gho and Farrington 2017).

More than any other institution or sociocultural shift intended to address the loss of fishing rights, the CDQ Program was highlighted by interviewees as a promising solution. The royalties earned from leasing rights or earnings from harvesting them are used by regionally based groups to fund fishery infrastructure and participation and community development projects in member communities. The Bristol Bay Economic Development Corporation has acted as a mechanism to support fishing livelihoods, though with mixed success (Apgar-Kurtz 2012; Ruby and Heyano 2016). Thematic findings from qualitative interview data suggest that BBEDC has played and will continue to play a significant role in providing the economic, human, physical, and indirectly the sociocultural resources needed to sustain fishing livelihoods in the region. Not all Bristol Bay communities are eligible for all CDQ benefits, however, which has created tension between coastal and upriver residents:

> I personally have brothers in Kokhanok and Igiugig [upriver communities] and they spent every summer down here fishing and they fished their whole lives—I have access to a resource that they don't. (Naknek drift fisherman, 1 March 2015)

Because of the perceived unfairness created by the CDQ Program's eligibility rules, in 2012 BBEDC extended its Permit Loan Program to all Bristol Bay residents. This and other financial support programs were described by interviewees as holding significant promise in slowing the outflow of locally held

permits, thereby chipping away the lack of access to fishing rights and the challenge it presents to fishing livelihood sustainability.

Even though fishing livelihoods in Bristol Bay have been radically transformed in the last century, several key livelihood resources persist. Subsistence is practiced by most families, and is a source of knowledge transfer, community and family bonding, and reinforcement of a shared, salmon-based identity and culture that extends to commercial fishing (Coleman et al. 2018; Holen 2017). Similarly, the place-based nature of fishing and human-landscape connections are foundational to fishing livelihoods (Donkersloot and Menzies 2015). People spend years growing up and learning to fish on their family's site on the beach, and others learn how and where to set a drift gillnet based on intimate, multigenerational knowledge of particular river mouths, sandbars, eelgrass beds, or other places. These places are also sites and living memories of fishing, learning, and bonding amongst kin and fishing partners. Family is a key resource for provision of other economic, human, and political resources through, for example, inheritance of fishing rights, high status in community and decision-making processes, and passage of fishing knowledge and training.

2.5. Summary and conclusions

Many events have defined and redefined fishery systems in Bristol Bay over its history. Combined, they have produced significant changes in the resource dependencies of fishing livelihoods, and the institutions, organizations, and processes that support or challenge their sustainability. In the preceding section, we described the human-salmon relationships that have formed the basis of fishing livelihoods in the Bristol Bay region for thousands of years. We have focused on key time periods—Indigenous, colonial, and the modern era—to illustrate how fishing livelihoods have changed through time as a result of persistent, multigenerational stresses (e.g., acculturation, privatization) and acute shocks (e.g., run failures, epidemics). Further, we have highlighted ways in which these stresses and shocks (and livelihoods themselves) were and are continually constituted and reshaped by geopolitics (e.g., statehood, colonization, war), economies (e.g., quality improvements, cannery cartels, seafood markets, joint-venture processing firms), governance (e.g., Bristol Bay Borough formation, Board of Fisheries, US Department of Commerce), and social change (e.g., rural-urban migration, post-secondary education, internet and social media) at local-to-global scales. In addition to consideration of scale and change through time with respect to fishing livelihoods, we have explored instances in which power and political resources were redistributed (e.g., Russia's sale of Alaska Native sovereignty to the US, industrialization of the fishery, privatization of access), resulting in disenfranchisement of local Alaska Native and non-native fishermen from their livelihoods.

Among the most significant agents of change in fishing livelihoods has been the implementation of a rights-based access system, which has seen the fishery become shorter, more resource-intensive, and less locally based than in any year since limited entry began. These changes have created multigenerational cultural and social shifts within communities local to the fisheries, as well as economic barriers for new entrants and uncertainty for livelihood fishermen (Carothers 2015; Coleman et al. 2018; Donkersloot and Carothers 2016; Knapp 2011; Reedy-Maschner 2007). Proponents of restricted-access management have argued that limited entry was needed to protect the resource, and that although the system has its flaws, it is working more or less as intended (Adasiak 1979; Rogers 1979). Our research findings agree with these sentiments; the local, multigenerational fishermen that depended on the fishery for their community, culture, and income did not want the fishery resource to be depleted, lest their livelihoods become extinct forever. But they also felt, and continue to feel, that they had no control over the solution to the problem, nor were their worldview and relationships to salmon considered in the design of the limited entry system. The fishery has shifted, in the minds of local fishermen, from one of respectful competition and cooperation to one of greed and disregard for local communities. In other words, the system was designed to benefit people with one particular neoliberal economic worldview, and it has (Young et al. 2018).

We have illustrated here that stresses and shocks may be described as past events, but their impacts are long-lasting and multigenerational. Further, they continue to happen because of the narrow view of fishery systems that we continue to take. In other words, contemporary discourses on commercial fisheries very rarely consider fishing as a livelihood. Until we as fishery managers, researchers, and decision-makers begin to appreciate fisheries for the diversity of meanings, practices, and resources they encompass we will be stuck repeating our mistakes that may, and often do, disenfranchise people and communities from their livelihoods. To that end, we (the authors) offer three recommendations. First, policies must reflect their target populations to avoid unintended social consequences (Petterson 1983). Fishery-specific regulations currently exist in Alaska's regulatory framework, such as dual-permit operations for the Bristol Bay drift gillnet fishery. Movement toward hyperlocal regulations requires a decentralized fishery governance system; i.e., more power and responsibility for decision-making in the hands of local advisory committees, rather than the Board of Fisheries and state lawmakers. Second, policies must be flexible and responsive to changes in biological as well as social, economic, political, and cultural structures underlying fishery systems. This includes consideration of historical shocks and stresses and their latent and ongoing impacts to fishing communities. Further, when new trends emerge, such as the loss of fishing rights from small, rural, and Alaska Native communities, policies must have the capacity to address these impacts through built-in flexibilities or rapid amendment process. Finally, place attachments and livelihood sustainability could be improved by embedding rights in coastal fishing

communities to reflect a commonly held view that public resources should not be remade into private property. Rather, they should be managed to ensure equitable access to fisheries.

2.6. References

Acheson, J. 2013. Co-management in the Maine lobster industry: a study in factional politics. *Conservation and Society,* 11(1): 60-71.

Adasiak, A. 1979. Alaska's experience with limited entry. *Journal of the Fisheries Board of Canada,* 36(7): 770-782.

Alaska Department of Fish and Game. 2018a. Division of Commercial Fisheries press release: 2018 Bristol Bay salmon season summary.

Alaska Department of Fish and Game. 2018b. *Division of Commercial Fisheries Commercial Operator's Annual Report – Production by area* [Data set]. Retrieved from https://www.adfg.alaska.gov/index.cfm?adfg=fishlicense.coar_production_byarea.

Alaska Department of Labor and Workforce Development. 2019. *Components of population change: total population place* [Data set]. Retrieved from http://live.laborstats.alaska.gov/pop/estimates/data/TotalPopulationPlace.xls.

Apgar-Kurtz, B. 2012. *Factors affecting local permit ownership in Bristol Bay and an evaluation of the BBEDC Permit Loan Program: an analysis based on interviews with local residents.* Master's thesis. Seattle: University of Washington.

Apgar-Kurtz, B. 2015. Factors affecting local permit ownership in Bristol Bay. *Marine Policy,* 56: 71-77.

Arnason, R. 2005. Property rights in fisheries: Iceland's experience with ITQs. *Reviews in Fish Biology and Fisheries,* 15(3): 243-264.

Arnold, D.F. 2009. *The fishermen's frontier: people and salmon in Southeast Alaska.* Seattle: University of Washington Press.

Barnett, A.J. and Eakin, H.C. 2015. "We and us, not I and me": justice, social capital, and household vulnerability in a Nova Scotia fishery. *Applied Geography,* 59: 107-116.

Bell, F.W. 1972. Technological externalities and common-property resources: an empirical study of the U.S. northern lobster fishery. *Journal of Political Economy,* 80(1): 148-158.

Berkes, F. 2010. Shifting perspectives on resource management: resilience and the reconceptualization of 'natural resources' and 'management'. *Maritime Studies,* 9(1): 13-40.

Bernard, H.R. 2011. *Research methods in anthropology: qualitative and quantitative approaches.* Rowman Altamira.

Bersamin, A., Zidenberg-Cherr, S., Stern, J.S. and Luick, B.R. 2007. Nutrient intakes are associated with adherence to a traditional diet among Yup'ik Eskimos living in remote Alaska Native communities: the CANHR Study. *International Journal of Circumpolar Health,* 66(1): 62-70.

Black, L.T. 1984. The Yup'ik of Western Alaska and Russian impact. *Études/Inuit/Studies,* 8(3): 21-43.

Boraas, A. and Knott, C. 2014. Appendix D: traditional ecological knowledge and characterization of the Indigenous cultures of the Nushagak and Kvichak watersheds, Alaska. *Volume 2: an assessment of potential mining impacts on salmon ecosystems of Bristol Bay, Alaska, appendices A-D.* Seattle, Washington: US Environmental Protection Agency.

Boraas, A. and Leggett, A. 2013. Dena'ina resistance to Russian hegemony, late eighteenth and ninetenth centuries: Cook Inlet, Alaska. *Ethnohistory,* 60(3): 485-504.

Boraas, A. and Peter, D. 2008. The role of *beggesh* and *beggesha* in precontact Dena'ina culture. *Alaska Journal of Anthropology,* 6(1): 211-224.

Bowman, K.R. 1951. Letter to Governor Gruening, June 10, 1951. Record Group 111 Office of the Secretary of Alaska, Series 103 Fishermen's Aid program. Anchorage, Alaska: National Archives, Pacific Alaska Region.

Branson, J.B. 2009. *The canneries, caches, and cabins of Bristol Bay, Alaska.* Dillingham, Alaska: Bristol Bay Economic Development Corporation.

Braund, S.J. 2017. *Set the net: the heritage significance of fish camp and wild salmon in Bristol Bay, Alaska.* PhD dissertation. Missoula: University of Montana.

Breslow, S.J. 2015. Accounting for neoliberalism: "Social drivers" in environmental management. *Marine Policy,* 61: 420-429.

Breslow, S.J., Sojka, B., Barnea, R., Basurto, X., Carothers, C., Charnley, S., Coulthard, S., Dolšak, N., Donatuto, J. and García-Quijano, C. 2016. Conceptualizing and operationalizing human wellbeing for ecosystem assessment and management. *Environmental Science & Policy,* 66 (2016): 250-259.

Bristol Bay Native Corporation 2018. Bristol Bay Native Corporation fiscal year 2018 annual report, Anchorage, Alaska.

Brown, J.J. 1994. Treaty rights: twenty years after the Boldt decision. *Wicazo Sa Review,* 10(2): 1-16.

Brown, W. 2016. American nightmare: neoliberalism, neoconservatism, and de-democratization. *Political Theory,* 34: 690-714.

Burch, E.S. 1994. The Iñupiat and the Christianization of Arctic Alaska. *Etudes/Inuit/Studies*: 81-108.

Carlson, S. 2002. Survey of Bristol Bay salmon drift gillnet fishery permit holders: preliminary summary of responses. Juneau, Alaska: Commercial Fisheries Entry Commission.

Carothers, C. Rationalized out: discourses and realities of fisheries privatization in Kodiak, Alaska. 2008. Enclosing the fisheries: people, places and power. American Fisheries Society Symposium, San Jose, CA. Pp. 55-74.

Carothers, C. 2010. Tragedy of commodification: displacements in Alutiiq fishing communities in the Gulf of Alaska. *Maritime Studies,* 9(2): 95-120.

Carothers, C. 2011. Equity and access to fishing rights: exploring the community quota program in the Gulf of Alaska. *Human Organization,* 70(3): 213-223.

Carothers, C. 2013. A survey of US halibut IFQ holders: market participation, attitudes, and impacts. *Marine Policy,* 38: 515-522.

Carothers, C. 2015. Fisheries privatization, social transitions, and well-being in Kodiak, Alaska. *Marine Policy,* 61: 313-322.

Carothers, C. and Chambers, C. 2012. Fisheries privatization and the remaking of fishery systems. *Environment and Society: Advances in Research,* 3(1): 39-59.

Carothers, C., Lew, D.K. and Sepez, J. 2010. Fishing rights and small communities: Alaska halibut IFQ transfer patterns. *Ocean & Coastal Management,* 53(9): 518-523.

Chambers, C. 2016. *Fisheries management and fisheries livelihoods in Iceland.* PhD dissertation. Fairbanks, Alaska: University of Alaska Fairbanks.

Chambers, C. and Carothers, C. 2017. Thirty years after privatization: a survey of Icelandic small-boat fishermen. *Marine Policy,* 80: 69-80.

Charmaz, K. 2006. Constructing grounded theory: a practical guide through qualitative research. *SagePublications Ltd, London*.

Choy, K., Potter, B.A., McKinney, H.J., Reuther, J.D., Wang, S.W. and Wooller, M.J. 2016. Chemical profiling of ancient hearths reveals recurrent salmon use in Ice Age Beringia. *Proceedings of the National Academy of Sciences,* 113(35): 9757-9762.

Cinner, J.E., Daw, T. and McClanahan, T.R. 2009. Socioeconomic factors that affect artisanal fishers' readiness to exit a declining fishery. *Conservation Biology,* 23(1): 124-130.

Coleman, J., Carothers, C., Donkersloot, R., Ringer, D., Cullenberg, P. and Bateman, A. 2018. Alaska's next generation of potential fishermen: a survey of youth attitudes towards fishing and community in Bristol Bay and the Kodiak Archipelago. *Maritime Studies,* 18(1): 47-63.

Commercial Fisheries Entry Commission (CFEC) 2018. Estimated permit value report: (S03T) salmon, drift gillnet, Bristol Bay.

Cooley, R.A. 1963. *Politics and conservation: the decline of the Alaska salmon.* New York: Harper & Row.

Copes, P. and Charles, A. 2004. Socioeconomics of individual transferable quotas and community. *Agricultural and Resource Economics Review,* 33: 171-181.

Costello, C., Gaines, S.D. and Lynham, J. 2008. Can catch shares prevent fisheries collapse? *Science,* 321(5896): 1678-1681.

Cramer, L.A., Flathers, C., Caracciolo, D., Russell, S.M. and Conway, F. 2018. Graying of the fleet: perceived impacts on coastal resilience and local policy. *Marine Policy,* 96: 27-35.

Crosson, S. 2011. Resistance to alternative management in fisheries: economic and cultural considerations of North Carolina's commercial fishers. *Politics and the Life Sciences,* 30(2): 31-42.

Crowley, R. and Palsson, H. 1992. Rights based fisheries management in Canada. *Marine Resource Economics*: 1-21.

Crutchfield, J.A. 1979. Economic and social implications of the main policy alternatives for controlling fishing effort. *Journal of the Fisheries Research Board of Canada,* 36(7): 742-752.

Crutchfield, J.A. and Pontecorvo, G. 1969. The Pacific salmon fisheries: a study of irrational conservation. Baltimore: Johns Hopkins Press.

Cullenberg, P., Carothers, C., Donkersloot, R., Coleman, J. and Ringer, D. 2017. Turning the tide: how can Alaska address the 'graying of the fleet' and loss of rural fisheries access? Anchorage, Alaska: University of Alaska Fairbanks.

Daw, T.M., Cinner, J.E., McClanahan, T.R., Brown, K., Stead, S.M., Graham, N.A.J. and Maina, J. 2012. To fish or not to fish: factors at multiple scales affecting artisanal fishers' readiness to exit a declining fishery. *PLoS ONE,* 7(2): 1-10.

Donkersloot, R. 2005. *Ecological crisis, social change and the life-paths of young Alaskans: an analysis of the impacts of shifting patterns in human-environment interaction in the fisheries-dependent region of Bristol Bay, Alaska.* Master's thesis. Missoula, Montana: University of Montana.

Donkersloot, R. 2007. Youth emigration and reasons to stay: linking demographic and ecological change in Bristol Bay, Alaska. In: Cullenberg, P., ed. Alaska's fishing communities: harvesting the future, Anchorage, Alaska. Alaska Sea Grant College Program, p. 73-79.

Donkersloot, R. and Carothers, C. 2016. The graying of the Alaskan fishing fleet. *Environment: Science and Policy for Sustainable Development,* 58(3): 30-42.

Donkersloot, R., Coleman, J., Carothers, C., Ringer, D., and Cullenberg, P. 2018. Kin, community and diverse rural economies: rethinking resource governance for Alaska rural fisheries. Manuscript submitted for publication.

Donkersloot, R. and Menzies, C. 2015. Place-based fishing livelihoods and the global ocean: the Irish pelagic fleet at home and abroad. *Maritime Studies,* 14(1): 1-19.

Eythórsson, E. 2000. A decade of ITQ-management in Icelandic fisheries: consolidation without consensus. *Marine Policy,* 24(6): 483-492.

Fall, J.A., Holen, D., Krieg, T.M., La Vine, R., Stickman, K., Ravenmoon, M., Hay, J. and Stariwat, J. 2010. The Kvichak watershed subsistence salmon fishery: an ethnographic study. Anchorage, Alaska: Alaska Department of Fish and Game.

Fienup-Riordan, A. 1995. *Boundaries and passages: Rule and ritual in Yup'ik Eskimo oral tradition.* Norman, Oklahoma: University of Oklahoma Press.

Foley, P., Mather, C. and Neis, B. 2015. Governing enclosure for coastal communities: social embeddedness in a Canadian shrimp fishery. *Marine Policy,* 61: 390-400.

Frink, L. 2009. The identity division of labor in Native Alaska. *American Anthropologist,* 111(1): 21-29.

Gho, M. and Farrington, C. 2017. Changes in the distribution of Alaska's commercial fisheries entry permits, 1975-2016. Juneau, Alaska: Commercial Fisheries Entry Commission.

Gislason and Associates Limited 2013. The British Columbia fishing industry—labour market information. Vancouver: British Columbia Seafood Alliance.

Glaser, B.G. 1978. *Theoretical sensitivity: advances in the methodology of grounded theory.* Mill Valley, California: Sociology Press.

Gordon, H.S. 1954. The economic theory of a common-property resource: the fishery. *Journal of Political Economy,* 62(2): 124-142.

Grainger, C.A. and Costello, C. 2016. Distributional effects of the transition to property rights for a common-pool resource. *Marine Resource Economics,* 31(1): 1-26.

Hamilton, L.C., and Seyfrit, C.L. 1993. Town-village contrasts in Alaskan youth aspirations. *Arctic,* 46(4): 255-263.

Hardin, G. 1968. The tragedy of the commons. *Science,* 162(3859): 1243-1248.

Harling Stalker, L. and Phyne, J.G. 2014. The social impact of out-migration: a case study from rural and small town Nova Scotia, Canada. *Journal of Rural & Community Development,* 9(3).

Haynie, A.C. 2014. Changing usage and value in the Western Alaska Community Development Quota (CDQ) program. *Fisheries Science,* 80(2): 181-191.

Hébert, K. 2008. *Wild dreams: refashioning production in Bristol Bay, Alaska.* PhD dissertation. Ann Arbor, Michigan: University of Michigan.

Hébert, K. 2014. The matter of market devices: economic transformation in a southwest Alaskan salmon fishery. *Geoforum,* 53: 21-30.

Hébert, K. and Mincyte, D. 2014. Self-reliance beyond neoliberalism: rethinking autonomy at the edges of empire. *Environment and Planning D: Society & Space,* 32(2): 206-222.

Himes-Cornell, A. and Hoelting, K. 2015. Resilience strategies in the face of short-and long-term change: out-migration and fisheries regulation in Alaskan fishing communities. *Ecology and Society,* 20(2): 9.

Hirschfield, M. 1991. The Alaska Native Claims Settlement Act: tribal sovereignty and the corporate form. *Yale Law Journal,* 101: 1331.

Højrup, T. 2011. *The Common Fisheries Policy has to recognize the need for common goods for coastal communities.* Gylling, Denmark: Narayana Press.

Holen, D. 2014. Fishing for community and culture: the value of fisheries in rural Alaska. *Polar Record,* 50(4): 403-413.

Holen, D. 2017. *Subsistence and commercial fisheries through the lenses of culture and economy in three coastal Alaskan communities.* PhD dissertation. Fairbanks, Alaska: University of Alaska Fairbanks.

Hughes, J. 1982. The great strike at Nushagak Station, 1951: institutional gridlock. *The Journal of Economic History,* 42(01): 1-20.

Hulme, D., Moore, K. and Shepherd, A. 2001. Chronic poverty: meanings and analytical frameworks. *Chronic Poverty Research Centre Working Paper No. 2.*

Jentoft, S. 2000. Legitimacy and disappointment in fisheries management. *Marine Policy,* 24(2): 141-148.

Kamali, N. 1984. Alaskan Natives and limited entry fisheries of Alaska: a study of changes in the distribution of permit ownership amongst Alaskan Natives, 1975–1983. Juneau, Alaska.

Kawagley, A.O. 1990. Yup'ik ways of knowing. *Canadian Journal of Native Education,* 17(2): 5-17.

Knapp, G. 2011. Local permit ownership in Alaska salmon fisheries. *Marine Policy,* 35(5): 658-666.

Koslow, J.A. 1982. Limited entry policy and the Bristol Bay, Alaska salmon fishermen. *Canadian Journal of Fisheries and Aquatic Sciences,* 39(3): 415-425.

Langdon, S.J. 1980. *Transfer patterns in Alaskan limited entry fisheries: final report for the Limited Entry Study Group of the Alaska State Legislature.*

Langdon, S.J. 2006. Traditional knowledge and harvesting of salmon by Huna and Hinyaa Tlingit. Anchorage, Alaska: US Fish and Wildlife Service, Office of Subsistence Management, Fisheries Resource Monitoring Program.

Larsen, S.C. 2004. Place identity in a resource-dependent area of northern British Columbia. *Annals of the Association of American Geographers,* 94(4): 944-960.

Lewicka, M. 2011. Place attachment: how far have we come in the last 40 years? *Journal of Environmental Psychology,* 31(3): 207-230.

Longo, S.B., Clausen, R. and Clark, B. 2015. *The tragedy of the commodity: oceans, fisheries, and aquaculture.* Rutgers University Press.

Loring, P.A. and Gerlach, S.C. 2009. Food, culture, and human health in Alaska: an integrative health approach to food security. *Environmental Science & Policy,* 12(4): 466-478.

Lyons, C.D. 2015. *Understanding place in fisheries management: an examination of ecological and social communities in the Pribilof Islands, Alaska.* PhD dissertation. Fairbanks, Alaska: University of Alaska Fairbanks.

Macinko, S. 2007. Fishing communities as special places: the promise and problem of place in contemporary fisheries management. *Ocean and Coastal Law Journal,* 13(1): 71-94.

Mann, C.C. 2011. *1493: Uncovering the new world Columbus created.* New York: Alfred A. Knopf.

Mansfield, B. 2004. Neoliberalism in the oceans: "rationalization", property rights, and the commons question. *Geoforum,* 35(3): 313–326.

Manson, S., Schroeder, J., Riper, D.V. and Ruggles, S. 2018. IPUMS National Historical Geographic Information System: Version 13.0 [Database]. Minneapolis: University of Minnesota.

Mantua, N.J., Hare, S.R., Zhang, Y., Wallace, J.M. and Francis, R.C. 1997. A Pacific interdecadal climate oscillation with impacts on salmon production. *Bulletin of the American Meteorological Society,* 78(6): 1069-1080.

McCarthy, J. and Prudham, S. 2004. Neoliberal nature and the nature of neoliberalism. *Geoforum,* 35(3): 275-283.

McCormack, F. 2017. Private oceans: the enclosure and marketisation of the seas. London: Pluto Press.

McCullough, N.S. 2001. *The 1951 Bristol Bay salmon strike: isolation, independence and illusion in the last frontier.* Master's thesis. Fairbanks, Alaska: University of Alaska Fairbanks.

McGrath, M. 2008. *The long exhile: a tale of Inuit betrayal and survival in the high Arctic.* Vintage Books.

McGregor, D. 2004. Coming full circle: Indigenous knowledge, environment, and our future. *American Indian Quarterly,* 28(3-4): 385-410.

Merton, R.K. 1938. Social structure and anomie. *American sociological review,* 3(5): 672-682.

Moon, K. and Blackman, D. 2014. A guide to understanding social science research for natural scientists. *Conservation Biology,* 28(5): 1167-1177.

Moore, D. 1995. *Alaska's lost frontier: life in the days of homesteads, dog teams, and sailboats.* Bellingham, Washington: Prospector Press.

Napoleon, H. 1996. *Yuuyaraq: the way of the human being.* Fairbanks, Alaska: Alaska Native Knowledge Network.

Olson, J. 2011. Understanding and contextualizing social impacts from the privatization of fisheries: an overview. *Ocean & Coastal Management,* 54(5): 353-363.

Palinkas, L. 1987. Points of stress and modes of adjustment in southwest Alaska. *Human Organization,* 46(4): 292-304.

Petterson, J.S. 1983. Policy and culture: the Bristol Bay case. *Coastal Zone Management Journal,* 10(4): 313-330.

Pinkerton, E. and Davis, R. 2015. Neoliberalism and the politics of enclosure in North American small-scale fisheries. *Marine Policy,* 61(2015): 303-312.

Poe, M.R., Donatuto, J. and Satterfield, T. 2016. "Sense of Place": human wellbeing considerations for ecological restoration in Puget Sound. *Coastal Management,* 44(5): 409-426.

Polanyi, K. 1957. *The great transformation: the social and economic origins of our time.* Boston: Beacon.

Power, N.G., Norman, M.E. and Dupré, K. 2014. "The fishery went away": the impacts of long-term fishery closures on young people's experience and perception of fisheries employment in Newfoundland coastal communities. *Ecology and Society,* 19(3): 6.

Pullar, G.L. 1992. Ethnic identity, cultural pride, and generations of baggage: a personal experience. *Arctic Anthropology,* 29(2): 182-191.

Reedy-Maschner, K.L. 2007. The best-laid plans: limited entry permits and limited entry systems in eastern Aleut culture. *Human Organization,* 66(2): 210-225.

Ringer, D., Carothers, C., Donkersloot, R., Coleman, J. and Cullenberg, P. 2018. For generations to come? The privatization paradigm and shifting social baselines in Kodiak, Alaska's commercial fisheries. *Marine Policy,* 98(2018): 97-103.

Rogers, G.W. 1979. Alaska's limited entry program: another view. *Journal of the Fisheries Board of Canada,* 36(7): 783-788.

Rosvold, E. 2007. Graying of the fleet: community impacts from asset transfers. *Alaska's fishing communities: harvesting the future. University of Alaska Fairbanks, Alaska Sea Grant College Program, Fairbanks*: 67-72.

Ruby, A. and Heyano, R. Efforts to regain permits: successes and challenges in Bristol Bay. In: Cullenberg, P., ed. Fisheries Access for Alaska: Charting the Future, 2016 Anchorage, Alaska. p. 73-80.

Salzman, M.B. and Halloran, M.J. 2004. Cultural trauma and recovery: cultural meaning, self-esteem, and the reconstruction of the cultural anxiety buffer. In Greenberg, J., Koole, S. L. & Pyszczynski, T. (eds.) *Handbook of experimental existential psychology.* New York London: The Guilford Press, p. (231-246).

Sathre, C. 1986. Salmon interception on the high seas: a continuing controversy between the United States and Japan. *Environmental Law,* 16(3): 731-755.

Schelle, K., Iverson, K., Free-Sloan, N. and Carlson, S. 2004. Bristol Bay salmon drift gillnet optimum number report: chapter 2. Juneau, Alaska: Commercial Fisheries Entry Commission.

Scoones, I. 1998. Sustainable rural livelihoods: a framework for analysis. *Institute of Development Studies Working Paper,* 72: 1-22.

Scoones, I. 2009. Livelihoods perspective and rural development. *The Journal of Peasant Studies,* 36(1): 171-196.

Shaw, R.D. 1998. An archaeology of the Central Yup'ik: a regional overview for the Yukon-Kuskokwim Delta, northern Bristol Bay, and Nunivak Island. *Arctic Anthropology,* 35(1): 234-246.

Shriver, J. 2012. CFEC permit holdings, harvest, and estimated gross earnings by resident type in the Bristol Bay salmon gillnet fisheries, 1975-2011. Commercial Fisheries Entry Commission, Juneau, Alaska.

Steiner, E.M., Criddle, K.R. and Adkison, M.D. 2011. Balancing biological sustainability with the economic needs of Alaska's sockeye salmon fisheries. *North American Journal of Fisheries Management,* 31(3): 431-444.

Sutton, M.Q. 2017. The "fishing link": salmonids and the initial peopling of the Americas. *PaleoAmerica,* 3(3): 231-259.

Symes, D. and Phillipson, J. 2009. Whatever became of social objectives in fisheries policy? *Fisheries Research,* 95(1): 1-5.

Thornton, T.F. and Scheer, A.M. 2012. Collaborative engagement of local and traditional knowledge and science in marine environments: a review. *Ecology and Society,* 17(3): 25.

Troll, T. 2011. *Sailing for salmon: the early years of commercial fishing in Alaska's Bristol Bay 1884-1951.* Dillingham, AK: Nushagak-Mulchatna/Wood Tikchik Land Trust.

Tussing, A.R., Morehouse, T.A. and Babb, J.D. 1972. Alaska fisheries policy. *Institute of Social, Economic and Government Research, University of Alaska, Fairbanks*: 279-332.

United Press International. 1991. Salmon fishing strike ends. 4 July 1991.

VanStone, J.W. 1967. *Eskimos of the Nushagak River.* Seattle, Washington: University of Washington Press.

VanStone, J.W. and Townsend, J.B. 1970. *Kijik: an historic Tanaina Indian settlement.* Chicago: Field Museum of Natural History.

Watts, M. 1994. Development II: the privatization of everything? *Progress in Human Geography,* 18(3): 371-384.

White, C.S. 2015. Getting into fishing: recruitment and social resilience in north Norfolk's 'Cromer Crab' fishery, UK. *Sociologia Ruralis,* 55(3): 291-308.

Williams, R. 2008. *Changing constructions of identity: fisher households and industry restructuring.* PhD dissertation. Newcastle, UK: Newcastle University.

Yandle, T. and Dewees, C.M. 2008. Consolidation in an individual transferable quota regime: lessons from New Zealand, 1986-1999. *Environmental Management,* 41: 915-928.

Young, O.R., Webster, D.G., Cox, M.E., Raakjær, J., Blaxekjær, L.Ø., Einarsson, N., Virginia, R.A., Acheson, J., Bromley, D., Cardwell, E., Carothers, C., Eythórsson, E., Howarth, R.B., Jentoft, S., McCay, B.J., McCormack, F., Osherenko, G., Pinkerton, E., van Ginkel, R., Wilson, J.A., Rivers, L. and Wilson, R.S. 2018. Moving beyond panaceas in fisheries governance. *Proceedings of the National Academy of Sciences,* 115(37): 9065-9073.

2.7. Appendices

2.7.1. Appendix A. Semi-directed interview question list.

Graying of the Fleet /Next Generation of Fishing Research Project
Semi-structured Interview Questions
August 2014

1. Tell us a little about your personal fishing background.
    a. When/how did you start fishing?
    b. Describe your first fishing job.
    c. Did your parents/family encourage you to get into fishing?
    d. Do you have family ties to fishing and community?
    e. Were you born here? How long have you lived here? Are your parents from here? Grandparents?
2. How were you able to enter into your fishery(ies)? [What opportunities did you have?]
3. What challenges did you face getting started in fishing?
4. What barriers exist for the next generation of fishermen trying to get their start in fishing?
5. [crew only] What types of traits do you value or look for in a captain or vessel as crew?
6. [crew only] How do (young) people here, who aren't from a fishing background, go about getting a crew job?
7. [crew only] What do you think is the most difficult thing about being a crewman?
    a. What is the most rewarding?
8. What are the biggest hurdles to managing your fishing operation/being a successful crewman?
9. What skills do you need to be successful in fishing?
    a. Are these skills you learned as a deckhand? Is this something anyone has taught you? Would that have been helpful/feasible?
    b. Prompts: business skills, financial management, getting a market, managing crew, knowledge of where and how to fish, etc.
10. What is your relationship to the canneries? Did they help/hinder you to become a fisherman?
    a. Tell us more about how canneries are involved in fisheries in this community?
11. What are your career goals moving forward?
12. Did your parents/family encourage you to move away from and/or stay here? Why/why not?
13. Do you think your parents/family would prefer that you stay in the community? Why/why not?
14. Where do you see yourself in five years? Ten years?
15. What do you need to be able to make a satisfying livelihood fishing [a happy fisherman]?
16. Have you worked other jobs (in addition to fishing)?
    a. Do you still?
    b. How important is this job to your monthly/yearly income?
    c. Is this work fishery related (outside of the harvesting sector)?
17. [Bristol Bay only] Are you familiar with BBEDC's Permit Loan Program?
    a. Have you used the program?
18. What are your thoughts on current fisheries management?
19. Do you ever think about getting out of fishing?
    a. Do you have an exit plan to sell and/or transfer your permit?
20. What other employment opportunities are available to people here? Can you see yourself in this field/line of work?
21. What do you need to live a good life [be happy] in your community?
22. What do you think are the best aspects of living here? What do you think are the most difficult?
23. When you think of successful fishermen in your community, what do you think makes them successful?
    a. Are there struggling fishermen here? What challenges do they face?
24. How do you imagine the fishing industry here in ten or 20 years?
25. How would this community change if fishing was no longer a thriving industry/[part of the community]?
26. What would you like to see in your community and region to support fishing in the future?
27. What options are there in your community/region/fishery for the next generation to get involved in fishing?
28. What does the fishing lifestyle (culture, way of life) mean to you?
29. What aspects of fishing give you the most pride?
30. When you think of commercial fishermen in your community what words (adjectives) come to mind?
    a. When you think of the (community) fishing community what words (adjectives) come to mind?
31. Is being a fisherman a respected career in your community? Why/why not? Has this changed at all over the course of your career (if appropriate)?
32. Is there anything else you'd like to add regarding the next generation of fishermen in your community?
33. Who else in the community is it important for us to talk with about this project?

Chapter 3. Alaska's next generation of potential fishermen: A survey of youth attitudes towards fishing and community in Bristol Bay and the Kodiak Archipelago[1]

3.1. Abstract

Commercial fishery participants in Alaska are increasing in age, and the next generation of fishermen faces numerous, complex barriers to entry into the industry. Although these barriers are now widely recognized, what remains to be seen is what influences whether or not the youngest generation of coastal residents will choose place-based fishing livelihoods. In this study, we surveyed seventh through 12th grade students in the fishery-dependent Bristol Bay and Kodiak Archipelago regions of Alaska to explore what factors best predict students' attitudes about commercial fishing and their communities. We used multinomial logit models of Likert-scale responses predicted by geographic, demographic, and social variables, as well as conditional inference trees to understand the direction, magnitude, and importance of the relationships among the predictor and response variables. Positive attitudes about fishing were best predicted by student experience in the commercial fishing industry, whether the student wanted to be involved in fishing in the future, and the importance of subsistence fishing to the student's family. Age, how the student felt about their life, the importance of subsistence activities, and whether the student grew up in the community in which they were surveyed were all strongly related to the student's positive attitude about their community. Youth surveyed in this study were highly uncertain about their futures, but key periods of exposure through community and family ties to fishing emerged as important mechanisms for engagement among the next generation of potential fishermen.

3.2. Introduction

The aging or "graying" of the commercial fishing fleet is an issue for the industry and fishery-dependent communities in coastal Alaska (Donkersloot and Carothers 2016). Between 1980 and 2016, the average age of a commercial fishery permit holder in Alaska has increased nearly 10 years (Gho and Farrington 2017). The increased average age of fishermen[2] indicates that older fishermen are continuing to fish beyond their expected retirement age, and younger fishermen are not replacing them. This demographic shift has significant implications for the future of the industry and for the coastal economies of the state of Alaska, which are heavily dependent on seafood exports and tax revenues collected from the harvesting and processing sectors, as well as economic multiplier effects of people employed in the fishing industry.

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[1] Coleman, Jesse, Courtney Carothers, Rachel Donkersloot, Danielle Ringer, Paula Cullenberg, and Alexandra Bateman. 2018. "Alaska's next generation of potential fishermen: a survey of youth attitudes towards fishing and community in Bristol Bay and the Kodiak Archipelago." *Maritime Studies* 109:1-17. 10.1007/s40152-018-0109-5.

[2] We use the term "fishermen" for male and female fishery participants, as it is how they referred to themselves in this study.

Multiple barriers to entry in commercial fishing stemming from the privatization of fisheries access, including financial and other socioeconomic challenges, have made pursuing fishing careers significantly more difficult for young fishermen than in decades past (Donkersloot and Carothers 2016; Petterson 1983; Power et al. 2014; White 2015). The high capital costs, lack of access to capital in the form of loans, and lack of financial literacy and business management skills are a few of many financial barriers experienced by young people who desire a career in commercial fishing. The financial barriers to entry into the commercial fishing industry in Alaska are well documented, but the outmigration of fishing rights and people, changing values in fishing, and social problems in fishing communities complicate such unidimensional economic explanations for the graying of the fleet trend (Carothers 2015; Ringer et al. 2018). For this reason, it is imperative that these issues be viewed through economic as well as social, cultural, and ecological lenses.

Barriers to entry are especially pertinent to the current generation of fishermen trying to make a successful livelihood from fishing, but uncertainty remains about the knock-on effects of graying trends on future generations of fishermen (and vice versa), namely today's youth living in coastal communities. For example, access rights and rights holders have migrated away from rural fishery-dependent communities over the past forty years, restricting local access to fishing opportunities and weakening the social ties between fishing and the community (Carothers 2015; Langdon 1980; Knapp 2011; Gho and Farrington 2017; Donkersloot and Menzies 2015; Donkersloot 2010). These ties have been further threatened by commodity market instability and low fish prices, years of low fish abundance, and in some regions disasters like the Exxon-Valdez oil spill and threats like the development of large-scale mining projects (Braund 2017; Hébert 2015; Donkersloot 2007; Fall et al. 2006). Whether the remaining ties are strong enough to continue to engage youth in the industry on which coastal communities rely is as yet unclear.

Whether or not a young person decides to enter the commercial fishing industry is subject to influences beyond the people, places, and ideas out their front door. Today's American youth, known as Generation Z, are experiencing cultural shifts linked to technology, information, and social media, as well as changing parental expectations around higher education, work, and social mobility that have increasingly seen rural youth migrate away from resource-dependent communities (Corbett 2005; White 2015; Glendinning et al. 2003). For instance, while there is a wealth of literature on rural youth aspirations (e.g., Rérat 2014; Panelli 2002; Hamilton and Seyfrit 1993; Corbett 2013; Argent and Walmsley 2008) relatively little is understood about staying or leaving, going to college or going to work, and choosing a career path in the context of large-scale cultural shifts and the fishing industry in the United States.

The objective of this paper, as part of a larger study on graying of the fleet trends in Alaska (Donkersloot and Carothers 2016), is to examine the factors influencing young people's attitudes towards, and level of participation in, Alaska fisheries. Are today's rural Alaska youth interested in pursuing fishing livelihoods? Or for that matter, do they expect to continue to live in rural Alaska? Based on our previous ethnographic research, we developed a survey to explore how the youngest generation of coastal residents perceives the fishing industry and their communities, by asking about their ties to fishing, their ambitions and desires for their own futures, and their feelings towards their communities. Quantitative and qualitative methods were used to draw inferences about students' attitudes about fishing and their communities and several geographic, social, and demographic factors derived from a school survey conducted among several study communities in the fishery-dependent regions of Bristol Bay and Kodiak Archipelago, Alaska.

3.3. Methods

3.3.1. Study site

The Kodiak Archipelago, located in the west-central Gulf of Alaska of the North Pacific, is made up of Kodiak Island and several surrounding islands (Figure 3.1). The region's largest community, Kodiak city[3], is home to a one of the most diverse, high-value (3rd in US; $137.5 million in 2015), and high-volume (2nd in US; 513.9 million lbs. in 2015) commercial fishing ports in the United States (National Oceanic and Atmospheric Administration 2017). The fisheries in the region target several species, including salmon, halibut, cod, and pollock among others, in geographically and temporally widespread fisheries. Fisheries are either state or federally managed, with varied access regimes and costs of entry and participation.

The Kodiak Archipelago communities selected for this study included Kodiak city, Ouzinkie, and Old Harbor. The Kodiak Island Borough, which includes communities within the Archipelago, had an estimated population of 13,732 in July 2016 (US Census Bureau 2017). In Kodiak city, which is the regional hub, nearly 14% of the population (6,130) identifies as Alaska Native and 35% identifies as Filipino—a population segment that has grown in part because of employment in the fish-processing sector (American Community Survey 2015). Populations in communities off the Kodiak road system are 60 to 95% Alaska Native, and the dominant cultural group in these communities is Sugpiaq (Alaska Native Heritage Center 2011, ADCCED 2017). The city of Kodiak is also home to the US Coast Guard Kodiak Air Station, which accounts for 1,301 enlisted personnel and their family members living on the island (US Census Bureau 2010). Military families make up 17.5% of Kodiak city's residents. The village

[3] The community is named Kodiak, but will be hereafter referred to as Kodiak city to distinguish it from the larger Kodiak region.

of Ouzinkie is located on Spruce Island, 12 miles north of Kodiak city accessible by air and water. Ouzinkie's population is 146, a majority of which are of Sugpiaq and Russian ancestry. Old Harbor, a village of 214 people, lies about 40 air miles south of Kodiak city. The communities residents are also of Sugpiaq and Russian descent, and subsistence harvests of fish, game, and wild plants are the cornerstone of life in both Old Harbor and Ouzinkie.

The Bristol Bay region is located in southwestern Alaska on the eastern edge of the Bering Sea. Its commercial fisheries are eighth in value ($90.1 million in 2015), and 18th in volume (69.6 million lbs. in 2015). The Bay is home to the largest wild sockeye salmon fishery in the world. A vast majority of fishing effort and harvest in the region is directed to the state-managed sockeye salmon fishery, although Chinook and coho salmon are also harvested commercially to a lesser extent. Other fisheries include federal individual fishing quota (IFQ) halibut and state limited entry herring sac roe in the Togiak district of the Bay. The region includes multiple census-designated places, the Bristol Bay Borough, the Lake and Peninsula Borough, and the Dillingham census area (unorganized borough). Roughly half of the Bristol Bay region's 6,848 residents identify as Alaska Native, though hub communities tend to have relatively fewer Alaska Native residents than villages (ADCCED 2017).

The four Bristol Bay communities selected for this study include Togiak, Dillingham, Kokhanok, and the Bristol Bay Borough (which includes Naknek, South Naknek, and King Salmon). The western Bristol Bay hub community of Dillingham is home to 2,300 year-round residents, 59% of whom identify as Alaska Native. A majority of Indigenous people in coastal areas of Bristol Bay are Yup'ik, which is a branch of the larger circumpolar Inuit cultural group. Located in Dillingham are most of the region's government services and a regional hospital. The village of Togiak is located approximately 40 air miles west of Dillingham, and has a population of 870 (80% are Yup'ik). Many residents participate in the super-exclusive commercial salmon fishery in Togiak Bay (i.e., if a permit holder registers in Togiak Bay, they may not fish in another district). Kokhanok is a village of 173 people located on the southwestern shore of Lake Iliamna, roughly 90 miles as the crow flies from the sea coast of Bristol Bay. Eighty percent of Kokhanok's residents are Alaska Native, and identify as Dena'ina Athabascan or Yup'ik. The three communities of the Bristol Bay Borough lie close in proximity, and government services and private businesses are spread amongst the communities and along the 15-mile-long road system. The communities of Naknek (population 504), South Naknek (74), and King Salmon (309) are the east side home to the bay's commercial fish processing activity, with over a dozen shorebased processing facilities and a busy airport. All study communities rely on subsistence hunting, fishing, and gathering to fulfill nutritional, spiritual, and cultural needs.

3.3.2. Target and sampling frame

Our target frame consisted of seventh through 12th grade students in public schools in the study communities. Communities were selected because the investigators had previously established research relationships with them, and the set of chosen study communities represented different attributes (e.g., participation in fisheries access programs, population, remoteness; see Donkersloot and Carothers 2016). Additionally, previous phases of this project involved ethnographic interviews with fishery participants and leaders in the study communities (see Ringer et al. 2018). Because the communities were not selected randomly, our goal with the survey and subsequent analyses was to make general inferences about youth fishing and community attitudes in the study communities and regions, and not to extend these inferences to communities that were not surveyed. The sampling frame included all students who attended classes the day the survey was administered, whose parents consented to allowing their child to take anonymous surveys during the 2014-2015 school year, and who volunteered to take the survey. In the Kodiak Archipelago region (Kodiak Island Borough School District, KIBSD), the schools surveyed included Kodiak Middle/High School, Ouzinkie School, and Old Harbor School. In Bristol Bay, Kokhanok School (Lake and Peninsula School District), Togiak School (Southwest Regional School District), Dillingham Middle/High School (Dillingham School District), and the Bristol Bay Borough School (BBB School District) were surveyed.

3.3.3. Survey instrument and implementation

A survey was developed from key concepts relating to youth and the fishing industry that emerged from interviews with community leaders and fishermen in the study communities. The five-page printed survey included three sections: 1) fishing background and student opinions, 2) community, and 3) student demographic information. The estimated length of time to complete was 20 minutes to 1 hour. In Bristol Bay, parental assent forms were sent home with students one to three days prior to implementation of the survey, asking them to sign and return the form if they did *not* want their child to participate. In the Kodiak Island Borough School District, parents were given a form at the beginning of the school year to obtain consent for their child to participate in surveys that did not collect sensitive information (e.g., names, birth dates, social security numbers). The authors administered the surveys with the support and approval of school staff, except in Kokhanok, where a local assistant was hired to distribute and collect surveys. Generally, surveys were distributed to teachers, students completed surveys anonymously during a single class period, and surveys were returned to researchers or the local assistant by the end of the school day. Raffles for gift cards to local stores were held at each school thank students for survey completion.

3.3.4. Data preparation

Survey responses were entered, coded, and stored in a Microsoft Excel spreadsheet. A subset of variables was selected for inclusion in regression analyses based on descriptive statistics and survey items specifically included to address research objectives. To account for item non-response (i.e., where students left one or several answers blank), missing value imputation was conducted using the `mice` function and package in R statistical software, using polytomous regression for categorical variables and predictive mean matching for continuous variables (R Core Team 2017; van Buuren and Groothuis-Oudshoorn 2011).

Two scales were constructed for the regression analyses: one based on a series of Likert items that asked students about their perceptions of the fishing industry, and another on Likert items pertaining to perceptions of their communities. Likert items were analyzed so that they measured positive perceptions of fishing and community; negatively phrased items were reverse coded. Hereafter, the scales will be referred to as "fishing attitude" and "community attitude".

A subset of Likert items was selected for scale construction using a graded response model, employing the `grm` function in R package `ltm` (Rizopoulos 2006). This function seeks to identify a single underlying trait from a series of multiple choice questions, and allows the researcher to select only those questions whose responses provide useful information about the latent trait—in this case, "positive fishing attitude" or "positive community attitude". This approach uses parametric, maximum-likelihood estimation in assessing scale reliability, rather than using a single metric like Cronbach's α. Chronbach's α assumes that the items within a scale are sampled at random from a domain of relevant items and reliability is calculated by reconfiguring variances into informative metrics (Cortina 1993; Tavakol and Dennick 2011). Item response theory and `grm` treats items as "random replicates of each other, and their characteristics, if examined at all, are expressed as correlations with total test score or as factor loadings on the putative latent variable(s) of interest" (Revelle 2007). Likert items were selected for inclusion in the respective Likert scales if the corresponding item information curves provided information as to the respondent's level of the underlying latent trait (i.e., positive fishing or community attitude).

Finally, fishing attitude and community attitude scales were adjusted and rescaled to fit the following interpretation: a fishing or community attitude score of zero indicated that the student responded "Strongly Disagree" to all Likert items that comprised the scale, and a score of 1 indicated all "Strongly Agree" responses. These scales were then modeled as response variables in a univariate linear regression modeling framework using function `svyglm` in package `survey`, which is specifically designed for modeling complex survey data (Lumley 2011).

3.3.5. Regression modeling

To ensure robustness of the response variable to linear modeling methods, the scales were modeled first as linear, then as logistic responses, the latter because parameter values that are bounded by zero and one are generally difficult to estimate using linear regression. The resulting parameter estimates and standard errors were very similar between the models (less than 1% difference in estimates), so linear responses were used because their parameter estimates are simpler and more intuitive to interpret than logistic regression parameter estimates. A range of models was developed as a candidate model set to be evaluated in a multimodel inference framework (Burnham and Anderson 2002). A saturated model, all leave-one-out models (i.e., one predictor variable was left out of the model in succession), and models consisting of subsets of predictors corresponding to geographic, demographic, and sociocultural factors were included in candidate model sets for fishing attitude and community attitude analyses, respectively.

The dAIC criterion, a version of Akaike's Information Criterion modified for survey data, was used to compare model likelihoods among candidate models (Lumley 2011). The dAIC is a relative measure that expresses the weight of evidence in favor of any model in the set being the "true" model from which the data were sampled. A difference of dAIC between any model and the lowest-ranked model is the delta dAIC, and a delta dAIC of seven is interpreted as virtually no support in the data for the model in question being the "true" model. All candidate models with delta dAIC less than seven were included in the plausible model set, across which parameter estimates were averaged.

3.3.6. Regression trees and random forests

Conditional inference trees recursively split a dataset according to categories or threshold values of the predictors most strongly associated with the response variable. Splits are made in the dataset until the null hypothesis of "no association between predictor x and the response" can no longer be rejected. The building of the conditional inference trees for the fishing and community attitude scales gave an indication of which variables were most important in identifying potential groups of respondents. Linear regression analysis gives estimates of the numerical relationships between each predictor and the response variable independently (unless interaction effects are specified), while regression trees are a non-parametric way to understand the importance of each predictor variable in relation to the others. Conditional inference trees for fishing attitude and community attitude scales were constructed using the R function `ctree` in package `partykit`. Random forests are groups of regression trees, each formed from a random, with-replacement sample of the training dataset. Random forests for fishing and community attitude scales were used to minimize the uncertainty in node placement that characterizes single regression trees. The random forests were constructed using the package `randomForest` in R.

3.4. Results

3.4.1. Summary statistics

Over 800 surveys were completed for this study. Survey response rates, defined as the number of students that completed the survey divided by the State of Alaska official enrollment for each school, are listed in Table 3.1.The ethnic identities of students differed markedly between Kodiak Archipelago and the Bristol Bay regions, with most students identifying as Alaska Native in Bristol Bay (78%; n = 148) and as white in Kodiak Archipelago (40%; n = 213; Figure 3.2), although 100% identified as Alaska Native in the Kodiak villages of Old Harbor and Ouzinkie. Preliminary analyses revealed contrasts in the kinds and strength of student ties to fishing between communities, principally that fewer than 9% of Kodiak city students (n = 48) had fished commercially at some point in their lives (Figure 3.3). In the Bristol Bay hub community of Dillingham, this figure was 45% (n = 57). Roughly 60-80% of all Bristol Bay, Ouzinkie, and Old Harbor students reported levels of current and past family engagement in fishing, while 22% (n = 112) and 31% (n = 143) of students reported current and past family ties, respectively, in Kodiak city (Figure 3.3). Responses to selected fishing attitude Likert items are presented in Figure 3.4 and Figure 3.5.

Overall, there was strong agreement that youth enjoy living in their communities now (63%, n = 495), but 23% of respondents (n = 180) disagreed with the statement "the future looks good for people who stay" (Figure 3.6 and Figure 3.7). Similarly, about one in five students wanted to leave their communities and not return, and two in five were not sure of their plans. Put differently, 38% of respondents (n = 300) hoped to return to their communities at some point in the future, whether permanently or seasonally. Responses to questions about particular aspects of community and the student's life there encompassed many factors, some of which were related to social well-being within the community. According to answers to open-ended questions, youth plainly recognized the challenges faced by their communities, and the most commonly cited concern was drug and alcohol abuse (44%; n = 279). Students also identified concerns such as remoteness and high costs of living (4%; n = 35); crime and violence (5%; n = 28); the limited and shrinking availability of local jobs (3%; n = 22). Roughly 10% of respondents had no concerns about their community.

3.4.2. Regression results

A two-sample t-test revealed significant differences in fishing attitude between regions[4] ($\hat{\bar{x}}_{BB}$ = 0.65, $\hat{\bar{x}}_{KA}$ = 0.41; $p < 2.2 \times 10^{-16}$), but not community attitude ($\hat{\bar{x}}_{BB}$ = 0.58, $\hat{\bar{x}}_{KA}$ = 0.60; p = 0.43). However, neither the regression nor conditional inference tree results suggest that region is a strong predictor of fishing or community attitude scores. The regression parameters can be interpreted as the

[4] BB = Bristol Bay; KA = Kodiak Archipelago

percent change in the fishing or community attitude score resulting from a one-unit increase (or going from the baseline to the category in question) in the predictor variable. For instance, for a one-year increase in age, a student's fishing attitude score would be expected to decrease by 0.3%. For a categorical predictor, the interpretation changes slightly. For example, for students in the Region category Bristol Bay (i.e., they are from a community in the Bristol Bay study region), an increase of 2.8% in fishing attitude is expected relative to students the baseline category, which is the Kodiak Archipelago.

The important predictors of fishing attitude (Table 3.2) included student experience in the commercial fishing industry, whether the student wanted to be involved in fishing in the future, and the importance of subsistence fishing to the student's family. Not having fishing experience decreased the student's estimated score by roughly 10% compared to those with fishing experience, while not wanting to be involved in fishing in the future decreased fishing attitude by 20% relative to those who did want to be involved in the future. Students who said subsistence fishing "used to be important", was "somewhat important" or "very important" had fishing attitude scores roughly 2.7%, 5%, and 11% higher, respectively, than those who said subsistence fishing was not important to their family. Similarly, students who rated the importance of income from commercial fishing as "somewhat important" or "very important" to their family had 3.4% and 7% higher scores, respectively, than those who rated family fishing income as "not important". Family fishing history also had positive effects on fishing attitude score. Students who reported their family having fished in the past, fished in the past and present, and presently fishing but not in the past, showed increases in scores of 4.9%, 7%, and 3.6%, respectively, compared to students whose families have never fished. Demographic variables such as age, gender, Alaska Native heritage, and whether or not students grew up in the communities in which they were surveyed all had minimal effects on fishing attitude score.

Important predictors of community attitude were age, how the student felt about their life, the importance of subsistence activity to their family, and whether the student grew up in the community in which they were surveyed (Table 3.3). Community attitude score decreased about 1% for each year of increasing age, or put differently, older students had slightly less positive community attitudes than younger students. A negative "outsider" effect was observed, in that students who did not grow up in the community had scores on average 8% lower than those who did. In Kodiak city in particular, a substantial portion of the student body came from military families that migrated to Kodiak from other US cities, although we did not specifically ask about family military engagement. An increase in community attitude score of about 8% was estimated for those who responded "life is good" versus those who said "life is bad". Students who said subsistence is "somewhat" or "very important" had community attitude scores 5.8% and 11% greater, respectively, than those who said subsistence was "not at all" important to their families. Complex models were favored in the model selection process, and all but the null model

and those including subsets of demographic variables and a region by hub/village interaction were included in the plausible model set (dAIC < 4).

3.4.3. Regression trees and random forest results

The top three most important predictors of positive fishing attitude were student's fishing experience, their desire to fish commercially in the future, and their family ties to fishing (Table 3.4). The importance of income from commercial fishing and subsistence fishing activity to a student's family were also important predictors of positive fishing attitude. With respect to community attitude (Table 3.5), the top three most important predictors of positive community attitude were the student's age, how they feel about their life, and the importance of subsistence fishing activity to their family. Whether the student grew up in the community was also an important predictor of community attitude (see discussion below). The results of the random forest generally agree with those of the dAIC-averaged generalized linear models.

3.5. Discussion

The factors associated with holding a positive view of commercial fishing among youth in this study included student experience in commercial fishing, family ties to commercial fishing, the importance of commercial fishing income and subsistence fishing to the student's family. Taken together, these results suggest that the more numerous a young person's ties to fishing, and the greater their level of exposure to fishing, and thus the more positively they regard commercial fishing. With respect to community, factors associated with positive perceptions included age, student well-being, importance of subsistence fishing to family, and whether a student was raised in the community. Below, we discuss these factors in the context of previous research on youth attitudes about fishing, linkages between subsistence and commercial fishing practices, and the enduring effects on youth fishery engagement of privatization of access in Alaska's coastal communities (Figure 3.8 and Figure 3.9).

3.5.1. Fishing attitude

Exposure to, engagement in, and family ties to commercial and subsistence fishing are important predictors of positive fishing attitude, and they are critical for sustaining new entry into fishing livelihoods. Youth in coastal communities are often first exposed to fishing through subsistence practices, or the gathering of wild foods for family and community use and sharing. Subsistence is a way of life for many rural Alaska residents, and studies among rural Arctic communities support the existence of a financial link between income from commercial fishing and the ability to purchase fuel and equipment for subsistence (e.g., Holen 2009, 2014; Poppel 2006; Reedy-Maschner 2009). Here, we have clearly demonstrated a positive relationship between engagement in subsistence activities and youth attitudes about commercial fishing. Subsistence fishing at setnet sites was often described by Bristol Bay interview participants as a "training ground" of sorts, where children too young to be on commercial drift vessels or

fast-paced setnet sites were exposed fishing, learned some of the necessary skills to be successful fishermen, and formed their identity around fishing. Holen's (2009) study in Kokhanok and other rural Alaska communities describes the transmission of cultural knowledge and traditional values to youth through family fishing experiences, and the importance of both types of fishing to the well-being of the community. Not only does commercial fishing enable subsistence fishing financially, but the two may be mutually reinforcing by fostering interest in the practice of fishing among the community's youth.

Enduring family ties to fishing provide knowledge, skills, and financial capital that facilitate youth engagement in commercial fishing. In this study, youth who possessed multigenerational family ties to fishing had 7% higher fishing attitude scores than those who had neither past nor current family members fishing. Family ties are a critical feature of how youth perceive the opportunities available to them (Glendinning et al. 2003), and they have changed dramatically since the privatization of access in many Alaskan fisheries in the mid-1970s (state limited entry program) and again in the mid-1990s (federal IFQ program). As families sold fishing rights during the initial period of privatization or moved away from their communities, an important opportunity to expose future generations of their family to fishing was lost, in many cases permanently (Apgar-Kurtz 2015; Langdon 1980; Reedy-Maschner 2007; Carothers 2008). In other cases, families were never engaged in fishing. For example, 20.6% of respondents in Kodiak city immigrated to fishing communities from the Lower 48 states (e.g., US Coast Guard families) or outside the US (e.g., Filipino families working in seafood processing sector), and likely don't have the same social or familial attachments and exposure to commercial fishing that youth with long family histories in the community and region have, and may not participate in fishing to the same extent. This feature of the social structure of Kodiak city, as compared to other Kodiak Archipelago villages and to hub and village communities in the Bristol Bay region, partially explains why youth have proportionally lower levels of engagement in fisheries. However, as is the case for most fishery-dependent communities in Alaska, Kodiak city has also experienced the loss of locally held fishing rights that accompanies privatized access regimes (Carothers 2015; Himes-Cornell and Hoelting 2015).

A student's desire to fish in the future is a strong positive predictor of fishing attitude (and vice versa). These relationships reinforce the notion that engagement in commercial fishing at a young age breeds interest in the practice later on. Youth attitudes towards fishing, among other things, are also heavily influenced by interactions with and the expectations of families and their peers (Byun et al. 2012; White 2015). In the interview phase of this research, many veteran fishermen recalled telling their children that commercial fishing was too financially and physically risky, and that they should have an education and career to fall back on. Somewhat paradoxically, those among today's youth that choose to enter commercial fishing in the future will most likely require the support—financial or otherwise—of their families in order to be successful (Donkersloot et al. in review). Parental discouragement from

pursuing fishing may be reflective of recent ecological and economic crises in Alaska's fisheries (e.g., the 1989 Exxon-Valdez oil spill, the depressed salmon prices in the early 2000s, fish population crashes) and of uncertainty and risk mitigation more generally (Carothers 2008; Donkersloot 2007; Lowe et al. 2012). Youth often internalize the messages that their families send them, even if it seems like they don't (Bjarnason and Thorlindsson 2006, Bjarnason 2014). If entire generations of youth have been told that fishing, at worst, is not a worthwhile career or, at best, is very risky, that might explain in part why fewer and fewer young people are entering the fishing industry.

3.5.2. Community attitudes and aspirations

The survey revealed that students' feelings about their communities and their futures are complex and uncertain. In most communities, students expressed ambivalence about life now in their communities, but largely disagreed that the future looked good for young people remaining in the community after high school. Similar feelings of ambivalence have been documented in other rural resource-dependent communities, where employment opportunities in local industrial sectors are attractive to some, but college, military, and other post-high school opportunities are the preferred paths of others (Schafft and Biddle 2015). In this study, smaller communities had higher percentages of students wanting to leave permanently than hub communities, similar to the findings of Hamilton and Seyfrit (1993). The reasons for and patterns in outmigration have been described in detail elsewhere, but in general, rural youth often seek attractive employment, social, recreational, and experiential opportunities that their home communities can't offer (Bjarnason and Thorlindsson 2006; Bjarnason 2014). Perhaps the most pervasive reason that rural youth across the globe desire to leave their communities it the pressure placed upon them to pursue higher education (Hamilton and Seyfrit 1993; Corbett 2005; White 2015).

Survey respondents expressed a great deal of uncertainty about what their futures will look like, with one exception: 88% of students said they want to go to college. Accordingly, 79% of students reported that their parents have encouraged them to attend college. Getting a college degree was both affirmed and challenged in the interview phase of this research as a viable pathway for the next generation of fishermen and for community sustainability in the face youth outmigration. Similarly, Corbett (2013) describes both the "pressure cooker environment" in which youth are pressured to pursue post-secondary education, and the sentiment common in the not-so-distant past that college was wholly unnecessary for a fishing life in the community. One Bristol Bay interview respondent linked regional summer internship programs with drawing local youth away from fishing jobs, essentially asking youth to choose between a guaranteed hourly wage for the summer and a less-certain, but possibly better-paying share on a fishing boat or site. When youth do decide to leave fishing communities, returning is challenged by the difficulty of putting a degree to use in a small town with limited employment

opportunities and by the social ties formed during college years that cement youth in their adopted places (Carr and Kefalas 2009).

With each new generation, the post-high school opportunities available to rural youth grow more numerous and diverse. Today, commercial fishing is one of thousands of career and education pathways youth can choose from. Lowe et al. (2012) described the cultural expectation in fishing communities that youth should pursue higher education instead of seeking career opportunities in a declining fishing industry. This expectation is affirmed by our finding that only 11% of Kodiak Archipelago students have been encouraged to enter commercial fishing by their parents or extended family, while nearly half of Bristol Bay students have been encouraged to enter commercial fishing. A young commercial fisherman from Kodiak described his fishing family parents' mixed support of his career choice:

> Interviewer: Did your family encourage you to get into fishing?
>
> Fisherman: Um, the exact opposite in fact. My mom was always telling me to go to college and my dad always told me he regretted not going to college, but I think my dad was—they were both supportive, but they were both leery of my decisions (Kodiak city fisherman, 17 October 2015)

Another important consideration in the degree to which youth are encouraged or discouraged to pursue commercial fishing careers is that participating in Bristol Bay's short salmon season is relatively compatible with college or non-fishing employment, which is not true of most other fisheries, like halibut and sablefish fisheries in the Kodiak Archipelago region. Even so, committing fully to a fishing career is a choice that students in this study were not ready to make. Previous research attributes some of the uncertainty faced by coastal youth in the Gulf of Alaska to the uncertainty and social disruption resulting from fisheries access privatization, single-sector rural economies, and resource and market instability, which have been translated to youth through daily interactions in the community and dinner-table conversations (Lowe 2015; Carothers 2015).

Old Harbor and Ouzinkie, villages in the Kodiak Archipelago study region, provide examples of the link between youth outlook on their communities and the level of fishing engagement in the community. We found that most youth in Ouzinkie do not see a future for themselves there, while Old Harbor students were more optimistic about opportunities available to them if they were to stay beyond graduation (Figure 3.7). Previous research has documented the dramatic decrease in fishing participation in both communities over the past generation, but this reduction has been especially severe in Ouzinkie, where only a couple of fishing boats remain active (Carothers 2010). Without a viable commercial fishing economy in Ouzinkie, adults and youth express concern for community sustainability. Accordingly, 83% of Ouzinkie students disagreed with the statement "my parents/family would prefer if I settled [in Ouzinkie]". Ouzinkie, Old Harbor, and many other communities throughout the Gulf of Alaska have actively fought for the repatriation of their fishing rights for the past several decades, with some initial success (e.g., the creation of the Community Quota Entity Program in the mid-2000s), but so far these

efforts have failed to generate a reversal of the trend of loss (Carothers 2011; Cullenberg et al. 2017). Continued access to fishing opportunities by local residents is critical in sustaining coastal communities culturally, socially, and economically (Clay and Olson 2008), and research has linked community health to the ability of residents to live meaningful and fulfilling lives in their communities (e.g., Martin 2012).

3.5.3. Limitations

Comparisons between hub and village communities were difficult to make in this study (and should be interpreted with extreme caution) because of the inherent imbalance in sample sizes resulting from non-random, non-stratified sampling of communities. In other words, small absolute numbers of students from village communities were sampled relative to the hub communities, due in part to the disparity in population between villages and hubs. In comparing the two study regions, differences with respect to each of the attitude scales were statistically significant. However, when viewed in the context of other factors such as family ties to or engagement in fishing, region and community size were not significant predictors of either fishing or community attitude. A stratified random sampling scheme in which communities were stratified by population size to include a greater number of villages would, in future applications of these methods, provide greater insight into how attitudes differ by community size and between fishery-dependent regions.

3.6. Conclusions

Exposure to, engagement in, and family ties to fishing are important predictors of positive fishing attitude, and they are critical for sustaining new entry into fishing. However, there are very real obstacles to converting youth engagement in fishing into the next generation of career fishermen, some of which are being addressed by other programs (e.g., financial barriers, training and skills). It is important to note that some influences on youth aspirations, such as changing cultural norms and modes of economic production in the US, cannot be controlled for by programmatic or policy changes. However, where the local culture is still supportive of fishing livelihoods, and career options are available for those who choose commercial fishing, youth engagement in fishing can be strengthened. Mechanisms are needed to recreate what was taken as natural in past generations: that youth living in coastal fishing communities would be exposed to fishing at an early age, and that commercial fishing could provide a good living—one that is place-based, culturally relevant, and economically viable. As fisheries access policies in Alaska and around the globe move increasingly toward privatized fishery rights and exclusion of small-scale fishery operations, fishing livelihoods and the critical periods of exposure to fishing during the childhoods of coastal youth will become fewer and farther between.

This study suggests there are further questions about how best to reconnect youth with fishing opportunities. In Alaska's limited entry fisheries, educational permits are specifically set aside for youth education and training, and are available for use by schools and other organizations with provisions for

recouping expenses through sale of commercially caught fish (5 AAC 93.200). Programs such as the Maine lobster fishery's student licensing and apprenticeship programs, while not motivated strictly by promoting local youth entry, serve to formalize engagement in and exposure to fishing, thus opening opportunities to youth who may not possess strong family ties to fishing (Alden and Brewer 2000). Apprenticeships may also provide benefits for rights-holders looking to build trust and share knowledge with an enterprising fisherman to which they may formally transfer rights in the future under negotiated terms. Less-structured programs designed for youth under the age of 18 may include commercial fishing camps, school curricula, or after-school programs (e.g., one modeled after the Future Farmers of America program). Legislation is currently moving through Congress that would, if passed in its current form, allocate funds in the form of three-year grants to regionally focused youth fishery education and training programs, and is potentially a first step towards formalizing fishing engagement and reestablishing commercial fishing as a career pathway in fishing regions of the United States, including coastal Alaskan youth (United States House of Representatives 2079; United States Senate 1323).

Youth in coastal communities today are uncertain about their futures. For most, those futures won't include commercial fishing or staying in their communities, in part because job opportunities are limited or have become unattractive, social challenges are problematic, and higher education requires leaving home. Fisheries policy can take a bottom-up approach to attracting future fishing generations by prioritizing and sustaining the connections between fishing livelihoods and coastal communities. Though fisheries management plans at the federal level require consideration of economic and social impacts on fishery-dependent communities, the stated purpose of fisheries management policies in the US is to conserve marine resources, and to provide the greatest economic benefit in the most efficient way possible to the nation (Clay and Olson 2008). While this is a monumental task filled with trade-offs and compromises between multiple objectives and stakeholders, fishery-dependent communities have been disproportionately burdened in this balancing act (Olson 2011). As fisheries policies continue to disenfranchise small-scale, local fishermen from their livelihoods—including their means of engaging in subsistence and providing for their families—opportunities for youth engagement in the practice, culture, and values of fishing will continue to diminish. The positive feedback loop of fishing exposure to the next generation, which depends on a healthy connection between fishing and the community, is strengthened by sustained local access to fishing rights.

3.7. Acknowledgments

First and foremost we would like to thank the student participants for their willingness to share their thoughts and opinions in this survey. We appreciate the support of the administration and staff of the Kodiak Island Borough School District, the Lake and Peninsula Borough School District, the Bristol Bay Borough School District, the Dillingham City School District, and the Southwest Region School District

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3.8. Figures

Figure 3.1. Map of Bristol Bay and Kodiak Archipelago study regions and sampled communities.

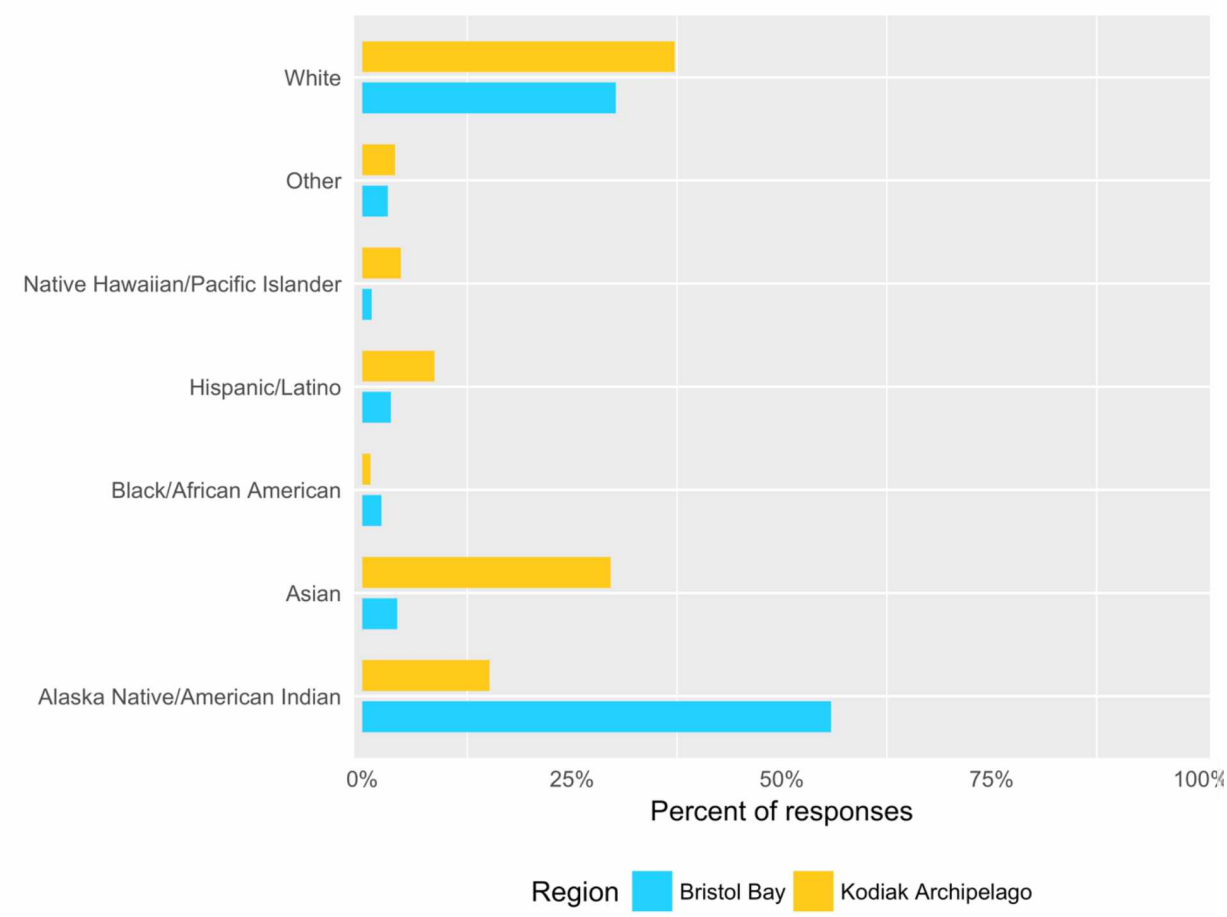

Figure 3.2. Ethnic identity of survey respondents by study region. Respondents were permitted to select more than one category.

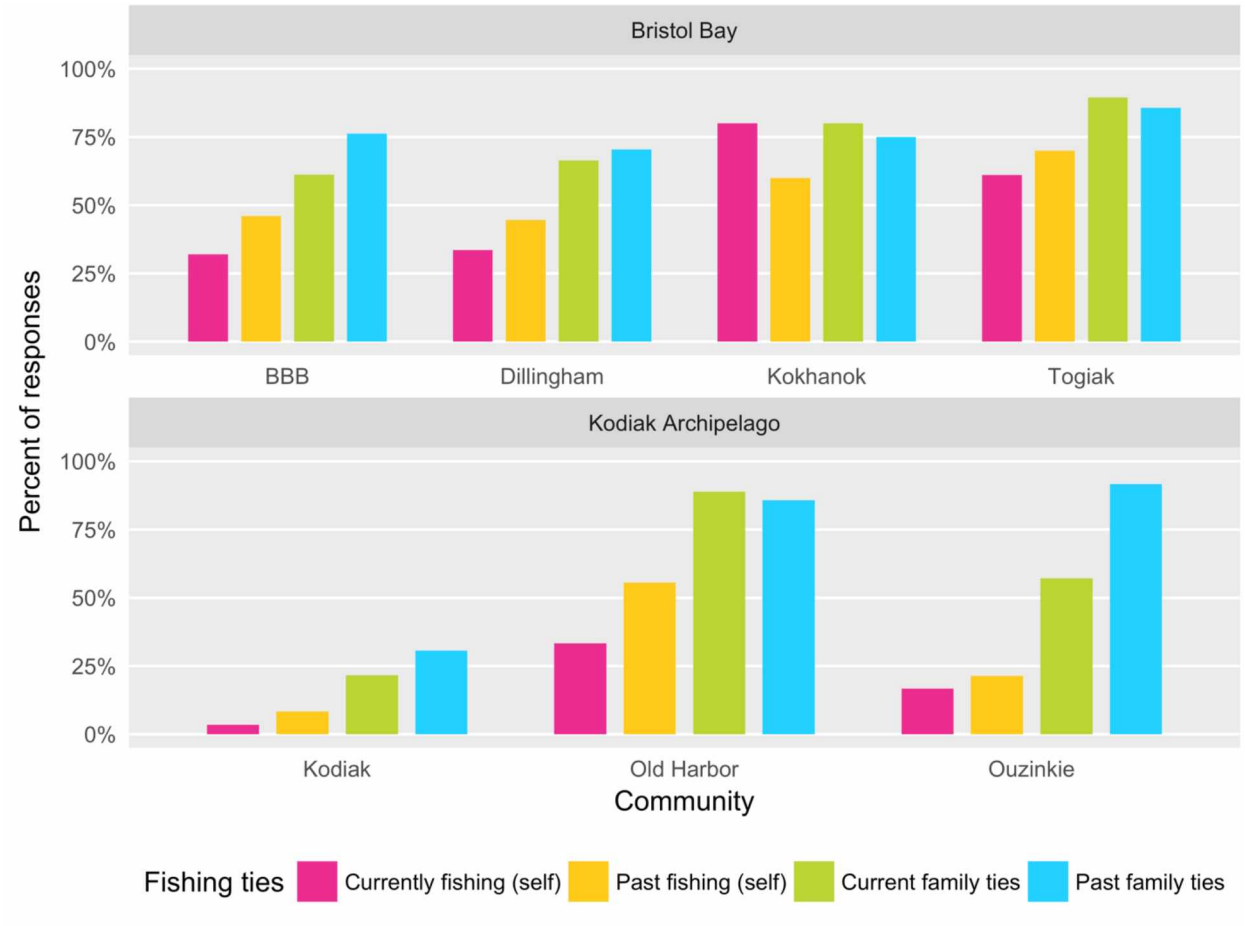

Figure 3.3. Ties to fishing by community for Bristol Bay and Kodiak Archipelago study regions.

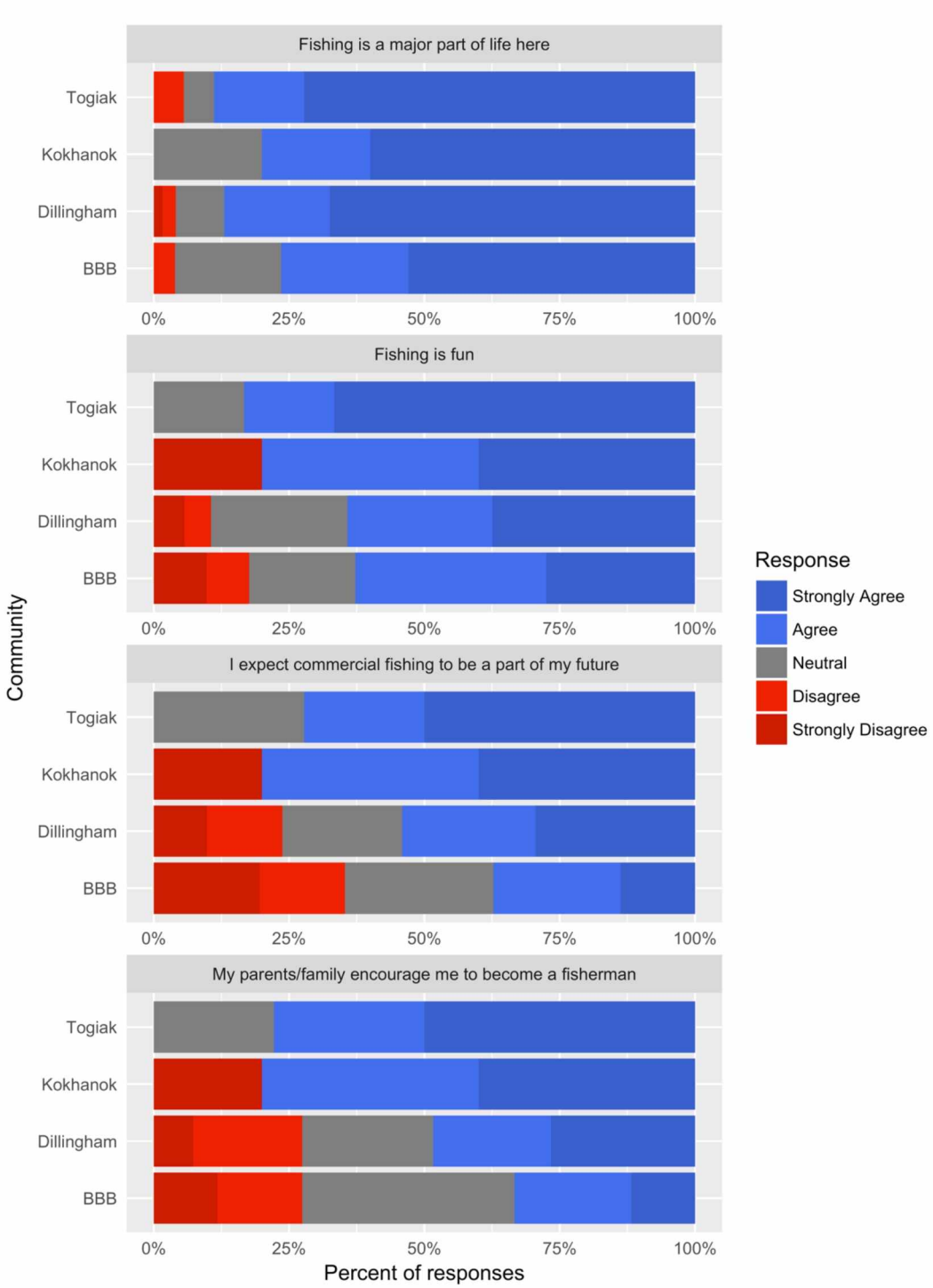

Figure 3.4. Responses to select Likert items related to commercial fishing for Bristol Bay communities.

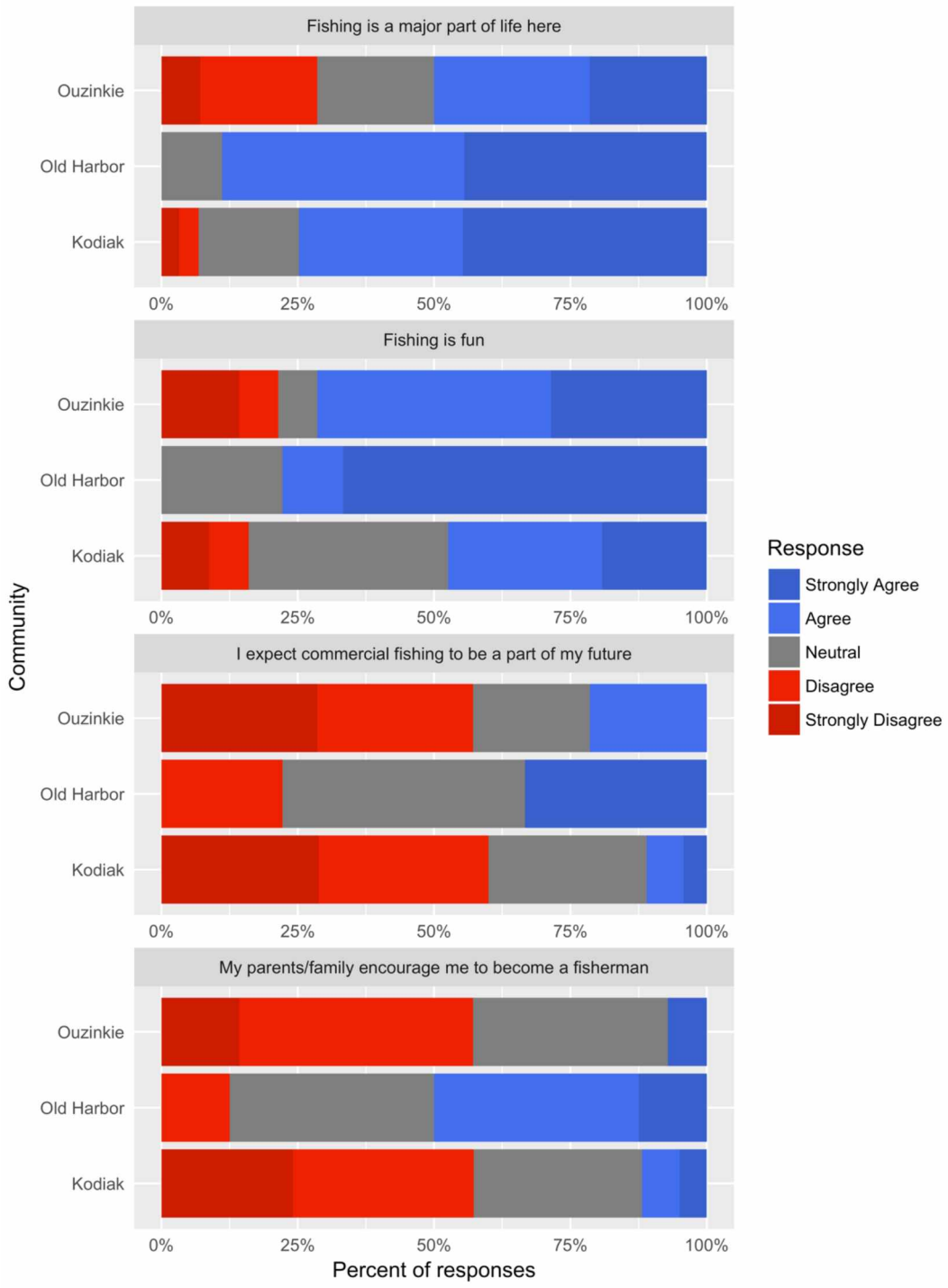

Figure 3.5. Responses to select Likert items related to commercial fishing for Kodiak Archipelago communities.

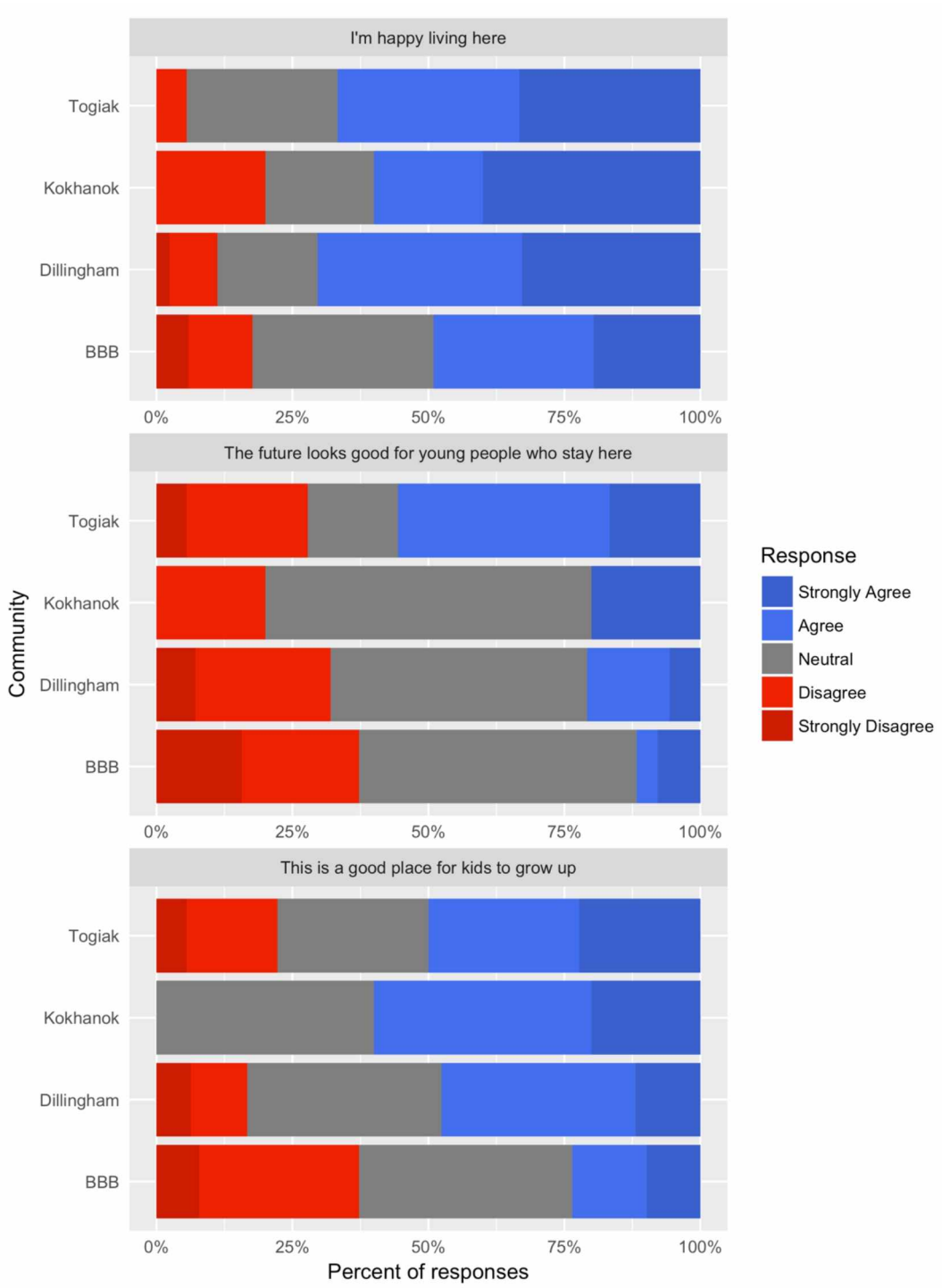

Figure 3.6. Responses to select Likert items related to community life for Bristol Bay communities.

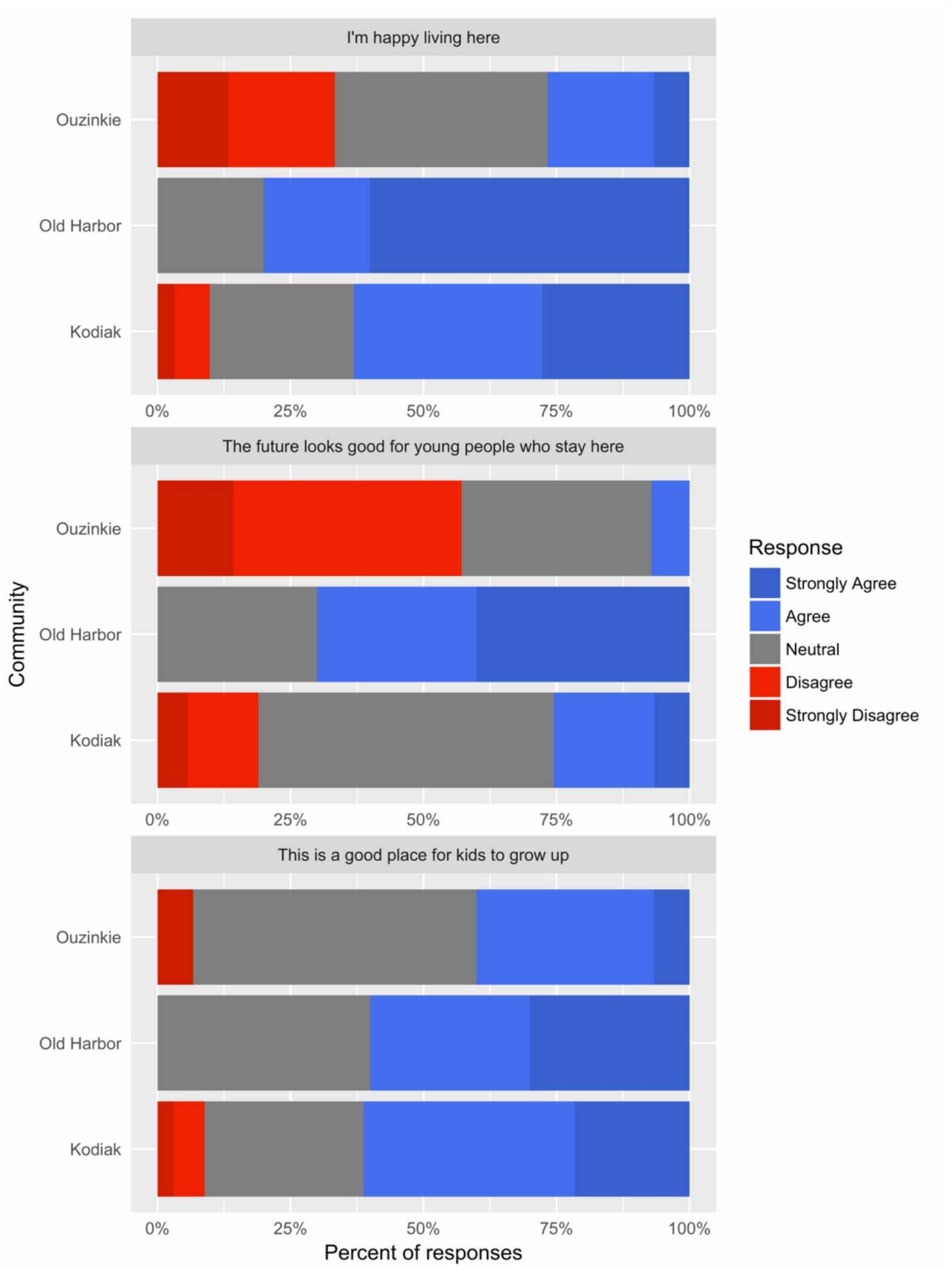

Figure 3.7. Responses to select Likert items related to community life for Kodiak Archipelago communities.

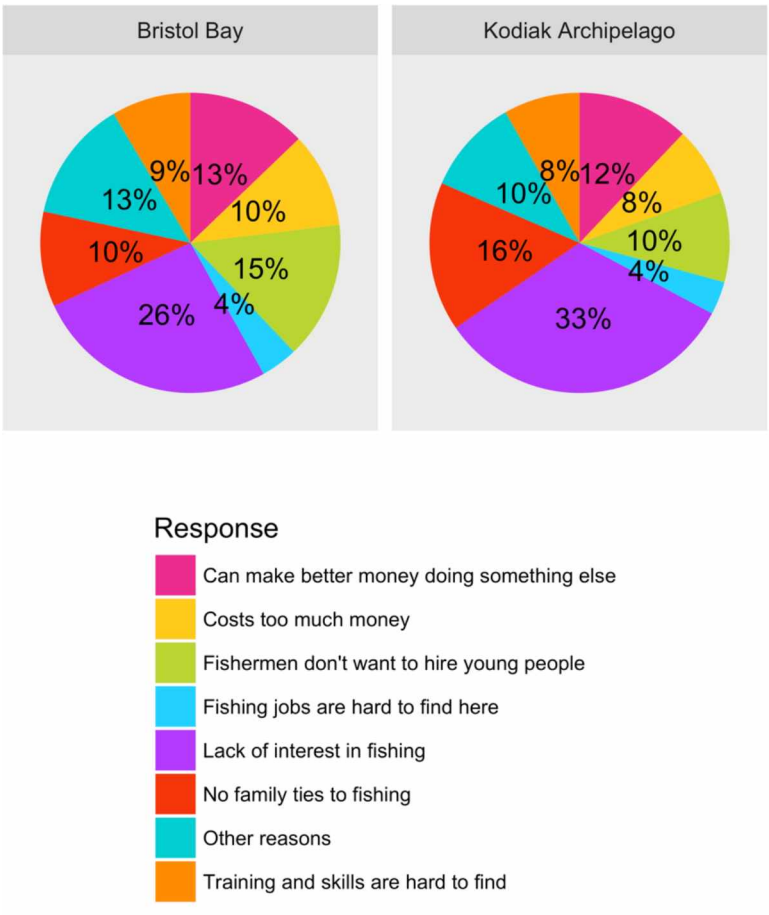

Figure 3.8. Top eight responses to the multiple-choice survey question "Why would you or another young person *not* get into commercial fishing?" for the Bristol Bay and Kodiak Archipelago study regions. Students were given the option to fill in additional reasons; these were coded and incorporated into the multiple-choice responses.

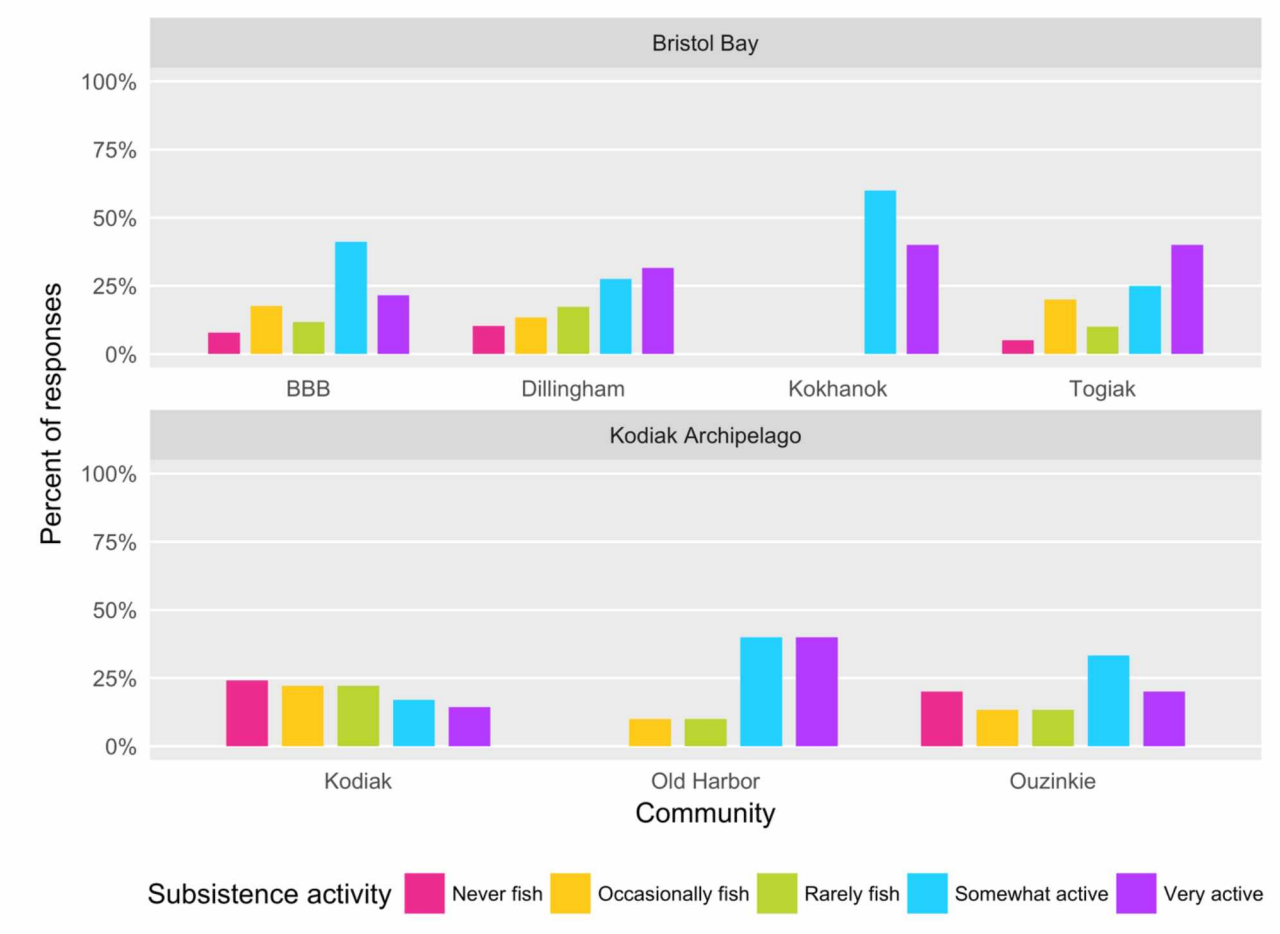

Figure 3.9. Responses to the multiple-choice question "How would you rate your family's subsistence activity over the past few years?" for Bristol Bay and Kodiak Archipelago communities.

3.9. Tables

Table 3.1. Response rates by community; number of surveys completed by 7th-12th grade students (three 6th graders took the survey) divided by the number of students enrolled in middle and high schools in each community during the 2014-2015 school year.

Region	Community Name	Enrollment	Surveys Completed	Opted Out	Response Rate
Bristol Bay	Bristol Bay Borough	59	51	0	86%
	Dillingham	211	128	0	61%
	Kokhanok	7	5	0	71%
	Togiak	86	20	4	23%
	Region total	363	204	4	56%
Kodiak Archipelago	Kodiak city	1,050	579	0	55%
	Old Harbor	24	13	0	54%
	Ouzinkie	30	15	0	50%
	Region total	1,104	607	0	56%
	Grand total	1,467	811	4	55%

Table 3.2. Positive view of fishing model-averaged parameter estimates (95% confidence level). Parameter estimates were averaged according to methods by Burnham and Anderson (2002), modified for design-based survey data using methods by Lumley and Scott (2015).

Parameter	Baseline	Category	Mod. Avg. β ($\tilde{\bar{\beta}}_j$)	Variance	SE	Lower Bound	Upper Bound
(Intercept)	-	-	0.6133	0.2945	8.67×10^{-2}	0.4433	0.7832
Region	Kodiak Archipelago	Bristol Bay	0.0257	0.0005	2.50×10^{-7}	0.0257	0.0257
Hub/village	Village	Hub	-0.0044	0.0012	1.39×10^{-6}	-0.0044	-0.0044
Fishing Experience	Yes	No	-0.1047	0.0152	2.32×10^{-4}	-0.1051	-0.1042
Desire to fish in the future	Yes	No	-0.2034	0.0466	2.17×10^{-3}	-0.2077	-0.1992
Family fishing	Never	Past only	0.0494	0.0012	1.55×10^{-6}	0.0494	0.0494
		Past and present	0.0700	0.0028	7.90×10^{-6}	0.0700	0.0700
		Present only	0.0359	0.0008	7.17×10^{-7}	0.0359	0.0359
Income importance	Not at all	Used to be	0.0008	0.0009	8.68×10^{-7}	0.0008	0.0008
		Somewhat	0.0340	0.0006	3.53×10^{-7}	0.0340	0.0340
		Very	0.0684	0.0025	6.35×10^{-6}	0.0684	0.0684
Subsistence importance	Not at all	Used to be	0.0277	0.0008	5.85×10^{-7}	0.0277	0.0277
		Somehwat	0.0507	0.0014	2.03×10^{-6}	0.0507	0.0507
		Very	0.1080	0.0078	6.11×10^{-5}	0.1079	0.1081
Desire to go to college	Yes	No	0.0063	0.0008	7.17×10^{-7}	0.0063	0.0063
Student grew up in community	Yes	No	0.0039	0.0002	4.80×10^{-8}	0.0039	0.0039
Age	-	-	-0.0028	0.0000	1.70×10^{-9}	-0.0028	-0.0028
Gender	Female	Male	0.0288	0.0005	2.08×10^{-7}	0.0288	0.0288
Alaska Native identity	No	Yes	0.0172	0.0003	8.97×10^{-8}	0.0172	0.0172
Region/hub interaction			-0.0019	0.0001	3.58×10^{-9}	-0.0019	-0.0019

Table 3.3. Positive view of community model-averaged parameter estimates, standard errors, and 95% confidence intervals. Parameter estimates were averaged according to methods by Burnham and Anderson (2002), modified for design-based survey data using methods by Lumley and Scott (2015).

Parameter	Baseline	Category	Mod. Avg. β ($\tilde{\bar{\beta}}_j$)	SE (unconditional)	Lower Bound	Upper Bound
(Intercept)	-	-	0.5890	3.55×10^{-2}	0.5195	0.6585
Region	Kodiak Archipelago	Bristol Bay	-0.0580	1.76×10^{-4}	-0.0584	-0.0577
Hub/village	Village	Hub	0.0128	1.08×10^{-4}	0.0125	0.0130
Fishing experience	Yes	No	-0.0113	3.96×10^{-5}	-0.0114	-0.0112
Subsistence importance	Not at all	Used to be	0.0342	1.77×10^{-4}	0.0338	0.0345
		Somewhat	0.0583	3.71×10^{-5}	0.0583	0.0584
		Very	0.1184	2.19×10^{-4}	0.1180	0.1188
Student grew up in community	Yes	No	-0.0824	9.18×10^{-5}	-0.0826	-0.0822
Age	-	-	-0.0123	1.85×10^{-7}	-0.0123	-0.0123
Gender	Female	Male	0.0173	1.11×10^{-5}	0.0173	0.0173
Alaska Native identity	No	Yes	-0.0084	1.81×10^{-5}	-0.0084	-0.0083
How student feels about life	Bad	Not sure	-0.0012	2.81×10^{-7}	-0.0012	-0.0012
		Good	0.0803	3.18×10^{-3}	0.0741	0.0866
Region/hub interaction			0.1809	5.59×10^{-3}	0.1699	0.1918

Table 3.4. Variable importance measures from random forest of fishing attitude scale. Importance rank based on the mean decrease in mean squared error (MSE) among response values achieved by inclusion of the predictor variable in question in the random forest model.

Predictor variable	Increase in MSE (%)	Increase in node purity	Importance rank
Region	0.0015	1.28	8
Hub/village	0.0007	0.77	11
Fishing Experience	0.0054	5.31	2
Desire to fish in the future	0.0189	11.05	1
Family fishing	0.0053	4.49	3
Income importance	0.0053	4.31	4
Subsistence importance	0.0043	4.29	5
Desire to go to college	0.0001	0.66	12
Student grew up in community	0.0002	0.84	10
Age	0.0001	3.30	6
Gender	0.0009	1.20	9
Alaska Native identity	0.0021	1.40	7

Table 3.5. Variable importance measures from random forest of community attitude scale. Importance rank based on the mean decrease in mean squared error (MSE) among response values achieved by inclusion of the predictor variable in question in the random forest model.

Predictor variable	Increase in MSE (%)	Increase in node purity	Importance rank
Region	0.0027	1.07	5
Hub/village	0.0003	0.86	8
Fishing experience	0.0010	0.85	9
Subsistence importance	0.0054	3.30	3
Student grew up in community	0.0031	1.74	4
Age	0.0021	3.92	1
Gender	-0.0001	0.97	7
Alaska Native identity	0.0014	0.99	6
How student feels about life	0.0073	3.78	2

3.10. References

Alaska Department of Commerce Community and Economic Development (ADCCED). 2017. Alaska Community Database Online.

Alaska Native Heritage Center. 2011. Unangax & Alutiiq (Sugpiaq) cultures of Alaska. http://www.alaskanative.net/en/main-nav/education-and-programs/cultures-of-alaska/unangax-and-alutiiq/. Accessed November 28, 2017].

Alden, Robin, and Jennifer F. Brewer. 2000. Apprenticeship and conservation initiatives. In *International Institute of Fisheries Economics and Trade IIFET 2000*. Corvallis, Oregon.

Apgar-Kurtz, Breena. 2015. Factors affecting local permit ownership in Bristol Bay. *Marine Policy* 56:71-77. http://dx.doi.org/10.1016/j.marpol.2015.02.013.

Argent, Neil, and Jim Walmsley. 2008. Rural youth migration trends in Australia: an overview of recent trends and two inland case studies. *Geographical Research* 46 (2):139-152. http://dx.doi.org/10.1111/j.1745-5871.2008.00505.x.

Bjarnason, Thoroddur. 2014. Adolescent migration intentions and population change: a 20-year follow-up of Icelandic communities. *Sociologia Ruralis* 54 (4):500-515.

Bjarnason, Thoroddur, and Thorolfur Thorlindsson. 2006. Should I stay or should I go? Migration expectations among youth in Icelandic fishing and farming communities. *Journal of Rural Studies* 22 (3):290-300.

Braund, Sarah Jane. 2017. Set the net: the heritage significance of fish camp and wild salmon in Bristol Bay, Alaska. Doctoral dissertation, University of Montana.

Burnham, Kenneth P., and David R. Anderson. 2002. Model selection and multimodel inference: a practical information-theoretical approach. New York: Springer-Verlag.

Byun, Soo-yong, Judith L. Meece, Matthew J. Irvin, and Bryan C. Hutchins. 2012. The role of social capital in educational aspirations of rural youth. *Rural Sociology* 77 (3):355-379. http://dx.doi.org/10.1111/j.1549-0831.2012.00086.x.

Carothers, Courtney. 2008. Rationalized out: discourses and realities of fisheries privatization in Kodiak, Alaska. In *Enclosing the fisheries: people, places and power.* American Fisheries Society Symposium.

Carothers, Courtney. 2010. Tragedy of commodification: displacements in Alutiiq fishing communities in the Gulf of Alaska. *Maritime Studies* 9 (2):95-120.

Carothers, Courtney. 2011. Equity and access to fishing rights: exploring the community quota program in the Gulf of Alaska. *Human Organization* 70 (3):213-223.

Carothers, Courtney. 2015. Fisheries privatization, social transitions, and well-being in Kodiak, Alaska. *Marine Policy* 61:313-322. http://dx.doi.org/10.1016/j.marpol.2014.11.019.

Carr, Patrick J., and Maria J. Kefalas. 2009. The rural brain drain. *The Chronicle of Higher Education* 9:1-13.

Clay, Patricia M., and Julia Olson. 2008. Defining "fishing communities": vulnerability and the Magnuson-Stevens Fishery Conservation and Management Act. *Human Ecology Review* 15 (2):143.

Corbett, Michael. 2005. Rural education and out-migration: the case of a coastal community. *Canadian Journal of Education* 28 (1):52-72. http://doi.org/10.2307/1602153.

Corbett, Michael. 2013. "I'm going to make sure I'm ready before I leave": the complexity of educational and mobility decision-making in a Canadian coastal community. *Journal of Rural Studies* 32 (1):275-282.

Cortina, Jose M. 1993. What is coefficient alpha? an examination of theory and applications. *Journal of Applied Psychology* 78 (1):98.

Cullenberg, Paula, Courtney Carothers, Rachel Donkersloot, Jesse Coleman, and Danielle Ringer. 2017. Turning the tide: how can Alaska address the 'graying of the fleet' and loss of rural fisheries access? Anchorage, Alaska: University of Alaska Fairbanks.

Donkersloot, Rachel. 2007. Youth emigration and reasons to stay: linking demographic and ecological change in Bristol Bay, Alaska. In *Alaska's Fishing Communities: Harvesting the Future*, ed. Paula Cullenberg. Anchorage, Alaska: Alaska Sea Grant College Program.

Donkersloot, Rachel. 2010. "Now hold on, my attachment to this place is home. That's it.": the politics of place and identity in an Irish fishing locale. *Maritime Studies* 9 (2):31-52.

Donkersloot, Rachel, and Courtney Carothers. 2016. The graying of the Alaskan fishing fleet. *Environment: Science and Policy for Sustainable Development* 58 (3):30-42.

Donkersloot, Rachel, and Charles Menzies. 2015. Place-based fishing livelihoods and the global ocean: the Irish pelagic fleet at home and abroad. *Maritime Studies* 14 (1):1-19.

Donkersloot, Rachel, Jesse Coleman, Courtney Carothers, Danielle Ringer, and Paula Cullenberg. In review. Kin, community and diverse rural economies: rethinking resource governance for Alaska rural fisheries. Marine Policy.

Fall, James A., Robert J. Walker, Ronald T. Stanek, William E. Simeone, L. Hutchinson-Scarbrough, Philippa Coiley-Kenner, L. Williams et al. 2006. Update of the status of subsistence uses in *Exxon Valdez* Oil Spill Area communities, 2003, ed. James A. Fall. Anchorage, Alaska: Alaska Department of Fish and Game, Division of Subsistence.

Gho, M., and C. Farrington. 2017. Changes in the distribution of Alaska's commercial fisheries entry permits, 1975-2016. Juneau, Alaska: Commercial Fisheries Entry Commission.

Glendinning, Anthony, Mark Nuttall, Leo Hendry, Marion Kloep, and Sheila Wood. 2003. Rural communities and well-being: A good place to grow up? *The Sociological Review* 51 (1):129-156.

Hamilton, Lawrence C., and Carole L. Seyfrit. 1993. Town-village contrasts in Alaskan youth aspirations. Arctic 46 (3):255-263.

Hébert, Karen. 2015. Enduring capitalism: Instability, precariousness, and cycles of change in an Alaskan salmon fishery. *American Anthropologist* 117 (1):32-46.

Himes-Cornell, Amber, and Kristin Hoelting. 2015. Resilience strategies in the face of short-and long-term change: out-migration and fisheries regulation in Alaskan fishing communities. *Ecology and Society* 20 (2):9.

Holen, Davin. 2009. The dynamic context of cultural and social sustainability of communities in Southwest Alaska. *Journal of Enterprising Communities: People and Places in the Global Economy* 3 (3):306-316.

Holen, Davin. 2014. Fishing for community and culture: the value of fisheries in rural Alaska. *Polar Record* 50 (04):403-413.

Knapp, Gunnar. 2011. Local permit ownership in Alaska salmon fisheries. *Marine Policy* 35 (5):658-666.

Langdon, Steve J. 1980. Transfer patterns in Alaskan limited entry fisheries: final report for the limited entry study group of the Alaska State Legislature.

Lowe, Marie E, Meghan Wilson, Robyn Miller, and Kate Sanders. 2012. Alaska coastal community youth and the future. Report prepared for the Alaska Sea Grant College Program. Institute of Social and Economic Research, Anchorage, Alaska.

Lowe, Marie E. 2015. Localized practices and globalized futures: challenges for Alaska coastal community youth. *Maritime Studies* 14 (1):1-25. http://dx.doi.org/10.1186/s40152-015-0024-y.

Lumley, Thomas. 2011. Complex surveys: a guide to analysis using R. John Wiley & Sons.

Lumley, Thomas, and Alastair Scott. 2015. AIC and BIC for modeling with complex survey data. *Journal of Survey Statistics and Methodology* 3 (1):1-18. doi:10.1093/jssam/smu021

Martin, Stephanie. 2012. Cultural continuity and communities and well-being. *Journal of Rural and Community Development* 7 (1):74-92.

National Oceanic and Atmospheric Administration. 2017. Commercial fishery statistics. https://www.st.nmfs.noaa.gov/commercial-fisheries/commercial-landings/other-specialized-programs/total-commercial-fishery-landings-at-major-u-s-ports-summarized-by-year-and-ranked-by-dollar-value/index. Accessed April 17, 2017.

Olson, Julia. 2011. Understanding and contextualizing social impacts from the privatization of fisheries: an overview. *Ocean & Coastal Management* 54 (5):353-363.

Panelli, Ruth. 2002. Young rural lives: strategies beyond diversity. *Journal of Rural Studies* 18 (2):113-122.

Petterson, John S. 1983. Policy and culture: the Bristol Bay Case. *Coastal Zone Management Journal* 10 (4):313-330. http://dx.doi.org/10.1080/08920758309361926.

Poppel, Birger. 2006. Interdependency of subsistence and market economies in the Arctic. In *The Economy of the North*, eds. Solveig Glomsrød and Julie Aslaksen, p. 65-80. Oslo: Statistics Norway.

Power, Nicole G., Moss E. Norman, and Kathryne Dupré. 2014. "The fishery went away": the impacts of long-term fishery closures on young people's experience and perception of fisheries employment in Newfoundland coastal communities. *Ecology and Society* 19 (3):6.

R Core Team. 2017. R: a language and environment for statistical computing. Vienna, Austria: R Foundation for Statistical Computing.

Reedy-Maschner, Katherine. 2009. Entangled livelihoods: economic integration and diversity in the Western Arctic. *Alaska Journal of Anthropology* 7 (2):135-146.

Reedy-Maschner, Katherine L. 2007. The best-laid plans: limited entry permits and limited entry systems in eastern Aleut culture. *Human Organization* 66 (2):210-225. http://doi.org/10.17730/humo.66.2.97231040w8jt857n.

Rérat, Patrick. 2014. The selective migration of young graduates: which of them return to their rural home region and which do not? *Journal of Rural Studies* 35:123-132.

Revelle, William. 2007. Experimental approaches to the study of personality. In *Handbook of Research Methods in Personality Psychology*, eds. R. W. Robins, R. C. Fraley, and R. F. Krueger, 37-61. New York: Guilford Press.

Rizopoulos, Dimitris. 2006. ltm: An R package for latent variable modeling and item response analysis. *Journal of Statistical Software* 17 (5):25. http://dx.doi.org/10.18637/jss.v017.i05.

Schafft, Kai, and Catharine Biddle. 2015. Opportunity, ambivalence, and youth perspectives on community change in Pennsylvania's Marcellus Shale region. *Human Organization* 74 (1):74-85.

Tavakol, Mohsen, and Reg Dennick. 2011. Making sense of Cronbach's alpha. *International Journal of Medical Education* 2:53.

United States House of Representatives. 2017. Young Fishermen's Development Act. US House of Representatives, 115th Congress, H.R. 2079.

United States Senate. 2017. Young Fishermen's Development Act. US Senate, 115th Congress, S. 1323.

van Buuren, Stef, and Karin Groothuis-Oudshoorn. 2011. mice: multivariate imputation by chained equations in R. *Journal of Statistical Software* 45 (3):67. http://dx.doi.org/10.18637/jss.v045.i03.

White, Carole Sandrine. 2015. Getting into fishing: recruitment and social resilience in north Norfolk's 'Cromer Crab' fishery, UK. *Sociologia Ruralis* 55 (3):291-308.

Chapter 4. Assessing the loss of commercial fishing rights in Bristol Bay, Alaska, with qualitative and quantitative data[1]

4.1. Abstract

Alaskan fishing communities have lost fishery access rights through transfer of permits and migration of permit holders since the implementation of the limited entry permit system in 1975. In this mixed-methods study investigating the changes that have occurred in the Bristol Bay salmon fisheries and the perceived barriers to entry for fishermen today, several themes were identified through ethnographic and grounded-theory analyses that are linked to the loss of locally held fishing rights. Themes included increasing age of permit holders, high costs of entry as a barrier for new entrants, and the impacts of ongoing outmigration of permits from the region. To contextualize these themes, we also characterize quantitative trends in permit holdings and fishery participation, age and population demographics, and economic metrics related to permit loss and new entry into the fisheries. By discussing ethnographic results in the context of quantitative trends, we highlight the ways in which different kinds of data can be used to produce a more robust and meaningful examination of the dynamics of fishery access rights. This approach is also valuable for identifying gaps in quantitative data coverage, and for describing the social dimensions of fishery rights distribution that cannot be gleaned from quantitative data alone.

[1] Coleman, J. M., C. Carothers, R. Donkersloot, D. Ringer, and P. Cullenberg. Manuscript prepared for submission to *Fish and Fisheries*.

4.2. Introduction

4.2.1. Background

In Alaska's salmon fishing communities, salmon and people are wholly intertwined. Local cultures, identities, and economies have evolved from the harvest of salmon for commercial, recreational, food and sharing, and spiritual purposes over thousands of years (Boraas & Knott, 2014; Fall et al., 2010). Local artwork, celebrations, and ways of viewing and interacting with the world are all influenced by the immensely important role that fishing plays in people's lives. Thus, the loss of fishing rights from rural Alaskan communities is a serious threat to the social, economic, and cultural wellbeing of fishery-dependent peoples, communities, and cultures, and has continued to grow unchecked since the privatization of state-managed salmon fisheries in 1975 (Carothers, 2015; Lavoie & Himes-Cornell, 2019; Olson, 2011). In these and other fisheries around the world, privatization (i.e., the restriction of fishery access to those who own the right to fish) has been linked to inequitable consolidation of rights (Carothers & Chambers, 2012; Eythórsson, 2000; Knapp & Lowe 2007; Stewart & Callagher, 2011), social stratification (i.e., haves and have-nots; Carothers, 2015), decreased multiplier effects and tax revenues for rural communities (Knapp, 2011; Northern Economics, 2009), disenfranchisement of Indigenous fishermen[2] (Carothers, 2013; Carothers, Lew, & Sepez, 2010), and perceived barriers to entry for young and new fishermen (Chambers & Carothers, 2017; Cullenberg, Carothers, Donkersloot, Coleman, & Ringer, 2017; Donkersloot & Carothers, 2016; Ringer, Carothers, Donkersloot, Coleman, & Cullenberg, 2018).

The loss of fishing rights from rural Alaskan communities has been described periodically since the early 1980s. Langdon (1980) was the first to document the outflow of limited entry[3] fishing permits from rural communities, but the specific causes and whether the trend would continue, worsen, or improve were unknown at the time. His work was the first to recognize the severe loss of permits in the Bristol Bay region (the focal area of this study) immediately following limited entry implementation. In 1984, Kamali linked names of limited entry permit holders to Alaska Native corporation[4] shareholder lists to identify the disproportionate loss of permits held by Alaska Natives. Five years later, Oakley (1989) reported on the distribution of permits among locals and nonlocals, and the contribution of the State of Alaska Commercial Fishing Loan Program to the migration of Bristol Bay fishing rights from rural to urban areas. The Alaska Commercial Fisheries Entry Commission (CFEC) compiles a report annually on

[2] We use the term "fishermen" to refer to all genders, as it is how fishermen in this study referred to themselves.
[3] Access to Alaska's state-managed fisheries is regulated by limited entry permit; details of the limited entry permit program are described in the Methods section.

[4] As part of the Alaska Native Claims Settlement Act, thirteen regional corporations were established to disburse payments from the federal government and dividends from corporate investments to its Alaska Native shareholders (Hirschfield, 1991).

the changes in distribution of permits among communities and residence categories, including information on transfers, migrations, cancellations, and permit holder age. More recently, Apgar-Kurtz (2015) described permit loss trends in the context of the Bristol Bay Economic Development Corporation's marginally successful efforts to repatriate permits (i.e., bring permits back to Bristol Bay through transfer to local residents) through multiple financial support programs. These authors and their findings have contributed greatly to our collective understanding of the loss of fishing access rights among fishing communities in Alaska. However, the meaning of this loss to the fishing people of Bristol Bay—given their sociocultural and economic dependence on fishery access—is not as well understood.

Since the 1950s, commercial fisheries have been viewed primarily through economic (e.g., Clark & Munro, 1975; Crutchfield & Zellner, 1973; Gordon, 1954) and biological lenses (e.g., Ricker, 1954; Walters & Hilborn, 1976). Gordon (1954) was one of the first to put forth an economic theory of fisheries, in which the implicit goal of fishery management is optimal utilization of the resource. This paradigm, combined with a marked ideological shift in the United States towards neoliberal governance, remade access to publicly held fishery resources into private property beginning in the 1970s. Neoliberalism is a belief system in which economic rationality, self-regulating markets, and private property rights are highly valued principles (McCarthy & Prudham, 2004; Polanyi, 1957; Watts, 1994). Building on neoliberal theory, other scholars have advocated for privatization of fishery access rights to control fishing effort and provide economically efficient returns (Arnason, 2008; Costello, Gaines, & Lynham, 2008). This wave of privatization, or conversion of the right to fish into a tradeable commodity, continues today despite numerous examples in small-scale fisheries of latent social and economic inequities. The transformation of fishery access to an alienable commodity invariably move these rights from the communities adjacent to the fishery to urban centers where there is a higher concentration of wealth and more competitive buyers (i.e., those with higher demand prices; Karpoff, 1984; Knapp, 2011).

In the late 1970s and 1980s, evidence of the unintended social consequences of such a single-minded view of fishery access began to surface (e.g., Fraser 1979, Rogers 1979, Petterson 1983). Concurrent with this discovery, disciplinary boundaries on fisheries research broadened to include anthropology (e.g., Acheson, 1975, 1981), behavioral psychology (e.g., Opaluch & Bockstael, 1984), political economy/ecology (e.g., Jentoft, 1989; Koslow, 1982), and early hybrid approaches (e.g., Charles, 1988). This expansion of research traditions grew out of the need to understand more fully the social dimensions of fishery systems, including how fishing-access-as-property functioned (or malfunctioned) in practice. From those efforts came the view that rather than being characterized solely by rational, self-interested behavior and economic efficiency, fishing has diverse meanings, including attachments to place, social cohesion and connections, independence and self-reliance, family ties, traditions, spirituality, and cultural identity (Coulthard, 2011; Foley, Mather, & Neis, 2015; Lewicka, 2011). Access to fishing,

then, is the foundation upon which these economic and non-economic meanings are built. In small-scale fisheries, the problem of lost fishery access has significant implications for the wellbeing of fishery-dependent people (Breslow, 2015; Weeratunge et al., 2014). Thus, fishery access is a key area of inquiry for many researchers.

Each discipline contributed to a more holistic understanding of fisheries and fishery access on a broad scale, but these diverse research efforts—and the researchers themselves—have largely remained siloed rather than integrated. In other words, ecologists answer ecological questions (e.g., population dynamics, movement, habitat use), economists answer economics questions (e.g., demand curves for transferable fishing rights, maximum economic yield), and anthropologists answer anthropological questions (e.g., place attachments, cultural values, power dynamics), but it remains uncommon practice for researchers to answer complex questions from multiple disciplinary perspectives (Mauser et al. 2013). Multiple ways of conceptualizing fishery access problems are of particular importance in the policy-making realm, where fisheries management must meet multiple biological, economic, and sociocultural objectives (Charles, 1991; Smith, Sainsbury, & Stevens, 1999). The research and analyses that go into defining and meeting those objectives is informed by varied, intersecting fields of study. Given this diversity, understanding fishery systems and designing policy requires an equivalent diversity of tools, methodological approaches, and epistemological traditions.

Mixed-methods approaches, or those in wherein "the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study" (p. 17; Johnson & Onwuegbuzie, 2004) are the *modus operandi* of pragmatic researchers. Pragmatism rejects dogmatic practice and philosophy associated with strictly quantitative or strictly qualitative traditions; mixed-methods allow for "multiple ways of seeing" a phenomenon or research question (Greene, 2007). Further, some phenomena are better suited for observation gathered using quantitative metrics, some using qualitative characteristics (Johnson & Onwuegbuzie, 2004). Take, for instance, a complex but observable phenomenon such as the perceptions of the fishing industry among residents of a fishing community. Using only quantitative metrics (e.g., years participating in the fishery, average fishing income) will not yield as robust or direct an understanding of the phenomenon as qualitative data (e.g., thoughts and feelings of multiple individuals). On the other hand, there are quantifiable metrics descriptive of the fishing industry from which insights may be drawn that would otherwise be impossible using only qualitative data (e.g., number of local participants per year, average annual value of fishing rights). The goal of mixed-methods research is to gain deeper insights about a system than would typically be possible using a single research approach.

In this paper, we will bridge findings from qualitative ethnographic data about the significance of permit loss and fishery access for the Bristol Bay region to quantitative trends in rights holdings among

different groups of fishermen. For example, in the ethnographic data, the theme "high costs of entry" emerged as a perceived barrier to entry for young and new fishermen. Quantitative data can be used to answer questions about specific patterns that drive perceptions about entry costs, such as whether there is a relationship between the cost of fishing rights and rates of entry over time, and whether this relationship differs between local residents and nonlocals. In this paper, we aim to contextualize rather than validate or question these ethnographic findings. Using a mixed-methods approach, we will discuss trends in fishery access rights holdings (quantitative), how they were perceived by residents of Bristol Bay, Alaska (qualitative), identify where gaps exist, and comment on where research and policy-change efforts are best spent moving forward.

4.2.2. Objectives

In this study, we describe key qualitative themes on fishery access permit loss in relation to trends in quantitative data, including 1) per capita permit holdings, 2) permit transfers, migrations, and cancellations, 3) new entry, and 4) permit holder age demographics.

4.3. Methods

4.3.1. Study site

The Bristol Bay region is home to the largest run of wild sockeye salmon in the world (Figure 4.1). From 1997 to 2016, the sockeye salmon run returning to Bristol Bay averaged 34.9 million fish, with the 2018 run exceeding 62 million fish (Alaska Department of Fish and Game 2018a). The region encompasses 34 million acres of land owned by the regional Alaska Native corporation, village corporations, individuals, companies, the State of Alaska, and the federal government. There are over 10,000 shareholders in the regional Alaska Native Claims Settlement Act corporation, the Bristol Bay Native Corporation (Berger, 1985; Hirschfield, 1991). Bristol Bay is part of the Western Alaska Community Development Quota Program (CDQ), which was established in 1992 to redistribute fishery earnings in industrialized offshore Bering Sea fisheries to coastal communities in western Alaska within 50 miles of the Bering Sea coast (Haynie, 2014). The regional CDQ group is the Bristol Bay Economic Development Corporation (BBEDC)[5]. A majority of Indigenous people in coastal areas of Bristol Bay identify as Central Yup'ik. Other cultural groups include Dena'ina Athabascan in the Lake Iliamna and Lake Clark regions, and Unangan (Aleut) and Sugpiaq along the northern and southern coasts of the Alaska Peninsula (Fall et al., 2010).

[5] For further reading about BBEDC and its role in Bristol Bay, see Donkersloot, Carothers, Coleman, & Ringer (2019), Ruby & Heyano (2016), and Apgar-Kurtz (2015).

Figure 4.1. Map of Bristol Bay region of Alaska. Study communities are shown in red. Indigenous place names are listed first in bold text; English names are listed below. Indigenous language names and approximate boundaries are shown in white.

4.3.2. Fishery and demographic background

For regulatory purposes, salmon fisheries in Bristol Bay are divided into commercial, recreational, and subsistence categories. The commercial fisheries encompass two gear types, including mesh gillnets deployed from vessels (i.e., drift gillnet) and gillnets fixed to permanent sites on the beach (i.e., set gillnet). Commercial fisheries account for the greatest harvest of salmon in the region, and are economically valuable to the region, state, and nation (Cannon & Warren, 2012; National Oceanic and Atmospheric Administration, 2017). Recreational fisheries for salmon provide additional value through sale of guide services mainly to nonlocal anglers, and subsistence fisheries are important for nutritional, cultural, spiritual, and social needs (Holen, 2017; Loring & Gerlach, 2009). As is common in rural communities in Alaska, commercial and subsistence fishing are mutually reinforcing, and both play important roles with respect to household and community economies and to individual, family, and community wellbeing (BurnSilver, Magdanz, Stotts, Berman, & Kofinas, 2016; Poppel, 2006).

The Bristol Bay region is comprised of three administrative areas: the Dillingham Census Area, the Bristol Bay Borough, and the Lake and Peninsula Borough, where boroughs are governmental units similar to counties in other US states. Population makeup and components of population change vary between areas (Table 4.1). In 2017, per capita incomes in all three areas were above the statewide estimate of $57,179 (Fried 2019). The top wage and salary employment sectors for residents of the Bristol Bay region include services, production (mainly in the form of fish processing) and government, including healthcare, education, aviation, and resource management (Abrahamson, 2011). Average harvest for both fisheries for the period 2009 and 2018 was 3.04 million fish (Salomone, Elison, Sands, Head, & Lemons, 2019), and the average values of the drift and set gillnet catches for the period 2015–2016 were $115 million and $25 million, respectively (McDowell Group 2017). Catches and earnings vary widely between local, nonlocal, and nonresident fishermen; statistics by residence are summarized in Table 4.2.

Table 4.1. Demographic information in Bristol Bay administrative areas. Net migration refers to the number of in-migrants minus the number of emigrants, natural increase refers to the number of births minus the number of deaths, and per capita income refers to the total income divided by the population (Alaska Department of Labor and Workforce Development 2019).

Administrative Area	Population (July 2018)	Percent Alaska Native[1] (2017)	Net migration (2010-2017)	Natural increase (2010-2017)	Per capita income (2017)
Dillingham Census Area	5,021	78.7%	-414	492	$59,340
Bristol Bay Borough	879	47.7%	-134	24	$126,725
Lake and Peninsula Borough	1,663	73.0%	-42	132	$59,760

[1]Alone or in combination

Table 4.2. Average fishery participation and earnings data by residence for the drift and set gillnet fisheries, 2009 to 2018 (Alaska Commercial Fisheries Entry Commission 2019).

Fishery	Residence	Average adjusted gross earnings	Average permits fished	Average pounds landed	Average earnings per permit
Drift	Local	$19,433,544	292.3	18,340,627	$66,763
	Nonlocal	$39,975,508	377.9	35,821,385	$105,030
	Nonresident	$101,675,077	843.5	90,377,763	$120,548
Set	Local	$11,857,518	313.2	11,543,317	$37,771
	Nonlocal	$9,445,913	244.8	8,996,470	$38,660
	Nonresident	$13,282,465	310.8	12,653,176	$42,656

4.3.3. Alaska's limited entry permit program

In 1972, Alaska voters passed a referendum to amend the state constitution to restrict fishery access to conserve fishery resources and to prevent economic distress to those dependent upon fishing for a living (AS 16.43.010; Rogers, 1979). Subsequently, the Limited Entry Act was passed to define the limited entry permit system and the criteria for allocation of fishery access. Several key concepts were used in the design of the limited entry framework, including maintaining access to fisheries for individual Alaskans (rather than nonresidents or corporate entities), especially those living in places with limited economic alternatives (Tussing, Morehouse, & Babb, 1972). The criteria that were developed to initially

allocate permits included economic dependence on fishing income (including availability of other occupations) and fishery participation during the years 1967 to 1971 (proven with tax returns or gear license documentation). Petterson (1983) identified two major flaws in the limited entry system, including: 1) the criteria and limitations used to determine economic dependence and fishing history were based on a rational, self-interested "strawman" fisherman and not the behaviors and patterns of actual fishermen (Fulton, Smith, Smith, & van Putten, 2011), and 2) the administrative processes of applying for and allocating fishing rights was extremely biased in favor of English-speakers and those fishermen whose behaviors and motivations aligned well with the "strawman" version of a fisherman (Koslow, 1982).

Limited entry permits confer the right to participate in a fishery that has been designated as limited by the state, and are administered by the CFEC. For technical purposes, a fishery is the combination of geographic area, species harvested, and gear type used (e.g., the Bristol Bay set gillnet fishery). The permit, which may only be held by an individual person, is revocable and is considered a 'use right' rather than private property. As such, permits may not be: "(1) pledged, mortgaged, leased, or encumbered in any way; (2) transferred with any retained right of repossession or foreclosure, or on any condition requiring a subsequent transfer; or (3) attached, distrained, or sold on execution of judgment or under any other process or order of any court" with few exceptions specified in statute (Alaska Statutes 2018). Permits may be used as collateral only for loans administered by the state or the Commercial Fisheries and Agriculture Bank, and are not able to be revoked by any entity other than the CFEC (e.g., the IRS cannot seize permits). Permanent permits are either transferable (i.e., able to be sold, gifted, or traded) or nontransferable (i.e., cannot be sold/gifted/traded and the permit is voided when permit holder dies). Permits may be transferred by the permit holder or cancelled by the state for one of several reasons listed in Table 4.3.

Table 4.3. Permit actions and their descriptions.

Permit action	Description
Administrative revoke	Cancellation of permit due to adjudication of permit application
Criminal revoke	Cancellation of permit due to nonpayment of child support or other court-ordered fines
Buyback	Voluntary sale of permit to reduce number of permits in fishery
Relinquish	Voluntary gift of permit to state
Forfeit	Cancellation of permit due to nonpayment of permit fees for two consecutive years (reversible in certain circumstances)
Reinstatement	Reversal of permit forfeit due to payment of fees and successful appeal
Lapse	Cancellation of permit due to death of nontransferable permit holder
Permanent transfer	Sale, gift, or trade of permanent permit
Emergency transfer	Medically necessary, temporary transfer of permit
Migration	Permit holder moves from one residence category to another

4.3.4. Qualitative data analysis

A brief overview of the qualitative data analysis methods will be presented here, but a more detailed description may be found in Coleman, Donkersloot, Carothers, Ringer, & Cullenberg (2019). We

used the semi-structured ethnographic interview format to document the perceptions held by Bristol Bay fishermen and community leaders with respect to the fishing industry, fishery management, and their community. Over 60 interviews in four study communities were audio recorded and transcribed in accordance with the University of Alaska Fairbanks' Institutional Research Board protocol (555479-10). Our research team coded each transcript using a hierarchical inductive coding scheme, wherein portions of text were "tagged" with one or more codes (Bernard, 2011). Examples of codes include *permit dynamics*, *access to capital*, and *fishing as livelihood*. Codes were then grouped and organized into higher-level themes. For instance, the codes *risk/uncertainty* and *access to capital* were grouped into the theme *barriers to entry*, as both codes are necessary to understand the larger phenomenon described by the theme. From these codes and themes, we developed analytical memos to more fully describe fishing access and youth and new entry into commercial fishing in the Bristol Bay region.

Excerpts of the analytical memos are provided for reference in Appendix 3. The memo-writing process is an important step in the development of a theoretical model. Memo writing involves, briefly, describing the codes and the linkages between them, the conditions under which codes may change; essentially a qualitative description of the nodes and links in a model (Charmaz, 2006; Glaser, 1978). The major components of the theoretical model (i.e., a grounded-theory model; Strauss & Corbin, 1990) we developed that lend themselves to indirect comparison to quantitative trends in permit loss will be discussed in the results section. The themes that were contextualized using quantitative data are described in the results section.

4.3.5. Quantitative data analysis

The quantitative data in this study are primarily from the CFEC. The names, addresses, permit numbers, unique identification number, and residency of current and past permit holders is publicly available on the CFEC website and is a major data source in this analysis. Other CFEC data sources include tables and appendices from their annual reports on the changes in permit distribution in limited entry fisheries (e.g., Gho & Farrington, 2018), other topical reports, and data requests made to CFEC specifically for this study. Other data include population estimates, subsistence fishery participation, permit values, and exvessel sockeye price; variables and their sources are listed in Table 4.4. Summary statistics (e.g., mean, median, percent difference) were computed to compare and contrast trends among groups of permit holders, primarily classified according to residence category (defined below). Locally weighted regression (loess) was used to fit a nonparametric model to time series of each metric (Cleveland & Devlin, 1988). Briefly, the loess method fits a curve to data by splitting the time series data into "windows"—in this case, subsets of years—and fitting a least-squares regression to the data points in the window. The fit is weighted by the proximity of the points within the window and the residuals

between the fitted model and the observed data. Simultaneous comparison of two quantitative metrics was made by fitting a least-squares linear regression model to the data.

Table 4.4. Quantitative variable names, description, and data sources.

Variable name	Description	Source
Permit holdings	The number of permits held per year aggregated by fishery and residence category or community	1, 2
Per capita permit holdings	The number of permits held per year aggregated by fishery and residence category or community, divided by its population	1, 2, 3, 4
Subsistence permits returned	The number of Bristol Bay subsistence fishery permits per year returned to the Alaska Department of Fish & Game, aggregated by community of permit holder residence	5
Mean permit holder age	The mean age of permit holders aggregated by fishery, year, and residence category	6
Percent change in age distribution	The change in the percent of permit holders, aggregated by fishery, residence category, in each of three age groups (under 40, 40 to 60, and over 60) between 1980 and 2017	7
Net cumulative transfers, migrations, and cancellations	The annual net change in permit holdings due to permanent transfer, permit holder migration, or cancellation, aggregated by fishery and residence category, and summed cumulatively across years	2
Number of foreclosures	The annual number of permit foreclosures aggregated by fishery and residence category	1
Transferable/nontransferable permit holdings	The annual number of permits aggregated by fishery, residence, and permit transferability	1
Number of permanent transfers	The annual number of permanent permit transfers aggregated by fishery and residence category of transferor and transferee	1
Average annual permit transfers	The mean annual number of permanent permit transfers aggregated by fishery and residence category from 1994 to 2017	1
New entrants	The annual number of first-time permit holders in a fishery (may have previously held a permit in another fishery) aggregated by fishery and residence category	1
Rate of new entry	The annual number of new entrants divided by total permit holdings aggregated by fishery and residence category	1
Estimated permit value	The annual estimate of permit values (in 2018 dollars) aggregated by fishery	8
Estimated exvessel sockeye price	The annual estimated price per pound paid for round sockeye salmon in the Bristol Bay Management Area	9

Sources:
1. Public permit holder database, CFEC (https://www.cfec.state.ak.us/plook/#downloads)
2. Appendix C, Gho and Farrington (2018) (https://www.cfec.state.ak.us/RESEARCH/18-2N/18-2N.html)
3. Population of US places, National Historical Geographic Information System (https://data2.nhgis.org/main)
4. Population estimates: places, Alaska Department of Labor (http://live.laborstats.alaska.gov/pop/)
5. Subsistence permit database, Alaska Department of Fish & Game (https://knb.ecoinformatics.org/view/doi:10.5063/F18S4N5G)
6. Table 4-2, Gho and Farrington (2018) (https://www.cfec.state.ak.us/RESEARCH/18-2N/18-2N.html)
7. Special data request, CFEC
8. Estimated permit value reports (https://www.cfec.state.ak.us/pmtvalue/mnusalm.htm)
9. Commercial Operator's Annual Reports (https://knb.ecoinformatics.org/view/doi:10.5063/F1T43RB0)

To understand the results more readily, some additional information is needed about the metrics and categories used. In this study, we defined per capita permit holdings as the number of permit holders residing in a community divided by the total population in that community. A decrease in per capita permit holdings could result from either a decrease in the number of permits that is greater than the decrease in population, or an increase in population that is greater than the increase in number of permits. Similarly, an increase in per capita permit holdings occurs from an increase in permit holdings greater than the increase in population or decrease in population greater than the decrease in permit holdings. Per

capita permit holdings and other metrics were frequently aggregated by fishery (drift or set gillnet) and residency category.

Prior to 1978, residency was determined by a single, unverified address provided by the permit holder. The CFEC then began to require a sworn declaration of residency for permit renewals and transfers. After 1982, permit holders were able to provide both a permanent address and a temporary address, the latter often being an address used by nonlocals during the fishing season for receipt of mailed permit cards or other communications. In general, CFEC asserts that there is a low incidence of misclassification of permit holder residency (Gho & Farrington, 2018). Residence categories[6], including Alaska rural local (ARL), Alaska rural nonlocal (ARN), Alaska urban local (AUL), Alaska urban nonlocal (AUN), and nonresident (NR), are determined by permanent address and residency affidavit of the permit holder, using three community-level attributes:

1) in Alaska or other US states or countries (first letter is A or initialism is NR; green card holders are eligible to hold limited entry permits);
2) is rural or urban (second letter is R or U, population less or equal/greater than 2,500 persons; see Gho and Farrington 2018, Appendix A);
3) is local to the fishery for which the permit applies (third letter is L or N; see Gho and Farrington 2018, Appendix A).

Rural/urban and local/nonlocal determinations are made for Alaska residents only. Since 1975, there have been 307 unique permit holders whose residence category is unknown; all list a nonresident address but claim Alaska residency.

Permit transactions refer to the net number of migrations and transfers of permits between residence categories. In a given year, net loss occurs when the total number of permits that migrate out or were transferred from a residence category is greater than the number that migrated in or were transferred to a residence category. For instance, if five non-ARL permit holders (i.e., ARN, AUN, NR) move to Dillingham (an ARL community) and six permit holders move from Dillingham to Anchorage (an AUN community), assuming no other permit movement involving ARL communities occurs, the net total migrations for that year for the ARL category is -1 (5 – 6 = -1). Net cumulative migrations or transfers are net migrations or transfers summed cumulatively across years, and show the effect that each transaction type has had on distribution of permits among residence categories over time.

[6] The residence categories were originally developed by Langdon (1980) and have been used by the CFEC since to describe patterns in the distribution of permit holdings.

4.4. Results

4.4.1. Ethnographic themes

The ethnographic themes relevant to trends in permit loss are described briefly below. More detail is provided in the analytical memos in Appendix 3. The first theme, *per capita permit holdings,* is described by the relationships between permit loss and community size. Interviewees asserted that larger Bristol Bay communities have experienced less severe declines in local permit holdings than small communities. Further, larger communities that are nonlocal (both urban and rural) have increased permit holdings above that of local communities. The perception is that small, local communities have been disproportionately impacted by permit loss, including the loss of senses of community identity and cohesion, fewer wage-earning opportunities and the ability to support a family, and overall decrease in community resilience and social functioning:

> And I feel really bad, because I feel that putting limited entry in, it almost stole the culture and the livelihood from the locals. Because they didn't understand what was really happening. And…if you couldn't prove that you fished during certain years, you couldn't get that limited entry either. And that's pretty sad, because who knows what those people were doing at the time. (Naknek set net fisherman, 26 February 2015)

There are three mechanisms by which permit holdings in a community may change, including transfer, migration, and cancellation (theme two). Specifically, interviewees discussed the transfer (i.e., sale) of permits to non-local and non-resident fishermen. Ethics and local customs have formed around the practice of selling to "outsiders" (a term often used by interview participants to describe nonlocals). Initially, when limited entry permits were still relatively new, getting the best price—which was typically not from a local resident—was the main objective in selling one's fishing rights. As permits left communities, however, the concept of selling locally gained support. While most interviewees said that keeping permits in the hands of local residents is an important social norm that is typically upheld when permits are transferred, others posed the question: would someone admit to selling their permit to a non-local, given the gravity of breaking such a norm? These interviewees suggested that transfers to non-locals still occur, but that people usually remain quiet about them.

A second form of permit loss occurs when a permit holder or family of permit holders moves away from their community. Typically, people move to Alaska's urban centers (e.g., Anchorage, Wasilla/Palmer, Fairbanks, Juneau) or out of state. Considering all limited entry fisheries in Alaska, the number of locally held permits that have moved to urban areas or out of state has contributed more to the loss of locally held permits than has sale/transfer of fishing permits to non-locals and non-residents. In Bristol Bay, however, the opposite is true: people have transferred permits to nonlocals more than they are moving away from the region:

> [The fishing permits have] gone with the people that used to live here. A lot of them. My grandmother—who fishes—my mother and my grandmother used to fish side by side. Those—I have my mother's permit. And ... my cousin has my grandmother's permit. And her mom has her permit still. So those permits haven't been

> sold, they've just been passed on. And most times it's just like that. I know that there have been some sales of permits. There was a gal—she sold out and somebody local here bought that too. So, there is an effort. At least I think in setnetting—that tries to keep it here. But in drifting, not so much. Drifting, there's a local guy ... he just sold to somebody—he tried to hold on to the permit to give the sale to his nephew, but the—his nephew was trying to go through BBEDC and the process was taking too long so his uncle said 'I gotta get rid of it.' (Naknek set net fisherman, 26 February 2015)

The loss of permits and its relationship to new entry into the fisheries is a key theme to emerge from this study (theme three). Several barriers to entry—processes, institutions, norms, or other things that obstruct or challenge access to commercial fisheries—were identified, including the high cost of entry in tandem with access to capital, privatization of fishing rights, oligopsonistic market/processing sector control (i.e., few buyers and many sellers), lack of fishing knowledge and experience, and exposure to commercial fishing, especially in communities that have experienced severe permit outmigration. Additionally, there are fewer new entrants into the drift and set gillnet fisheries than in previous decades and rates of new entry among local permit holders are lower than nonlocal categories.

Overall, fewer young fishermen are entering the fisheries as permit holders compared to the 1980s and 1990s (theme four). This theme is related to the theme "new entry" described above, in that young fishermen are entering the fishery, but they tend not to be local permit holders. Interview participants also observed that young people have no desire to enter fishing, lack the work ethic needed to be a permit holder (i.e., captain), or are not exposed to fishing culture and opportunities to the degree that their parents and grandparents were, in addition to being exposed to a much broader range of career and lifestyle choices. The trend of aging permit holders is concerning for both the future of the local commercial fleet and for the community.

The qualitative themes indicate that significant changes in social and economic dynamics have occurred on individual, community, and regional levels as a result of permit distribution patterns. To understand more fully and precisely the magnitude and temporal features of these changes, below we summarize patterns in several quantitative metrics related to the qualitative themes.

4.4.2. Per capita permit loss

Transferable and non-transferable permanent entry permits were issued in the Bristol Bay salmon fisheries (Figure 4.2). The former may be sold, gifted, or traded while the latter may not. In the set gillnet fishery, 158 nontransferable permanent permits were issued; the majority of these were issued to Alaska rural locals after initial issuance in 1975 (41%; 65 permits[7]). No nontransferable permits were issued in the drift fishery. The set gillnet fishery, long considered to be "the locals' fishery", had more nonresident

[7] 65 nontransferable permits were issued to ARLs in total; 25 of those were issued to ARLs in 1976.

permit holders than any other residence category for the first time in 2014 (ARL = 336, ARN = 67, AUN = 225; NR = 349)[8]. From 1975 to 2013, ARLs outnumbered NRs.

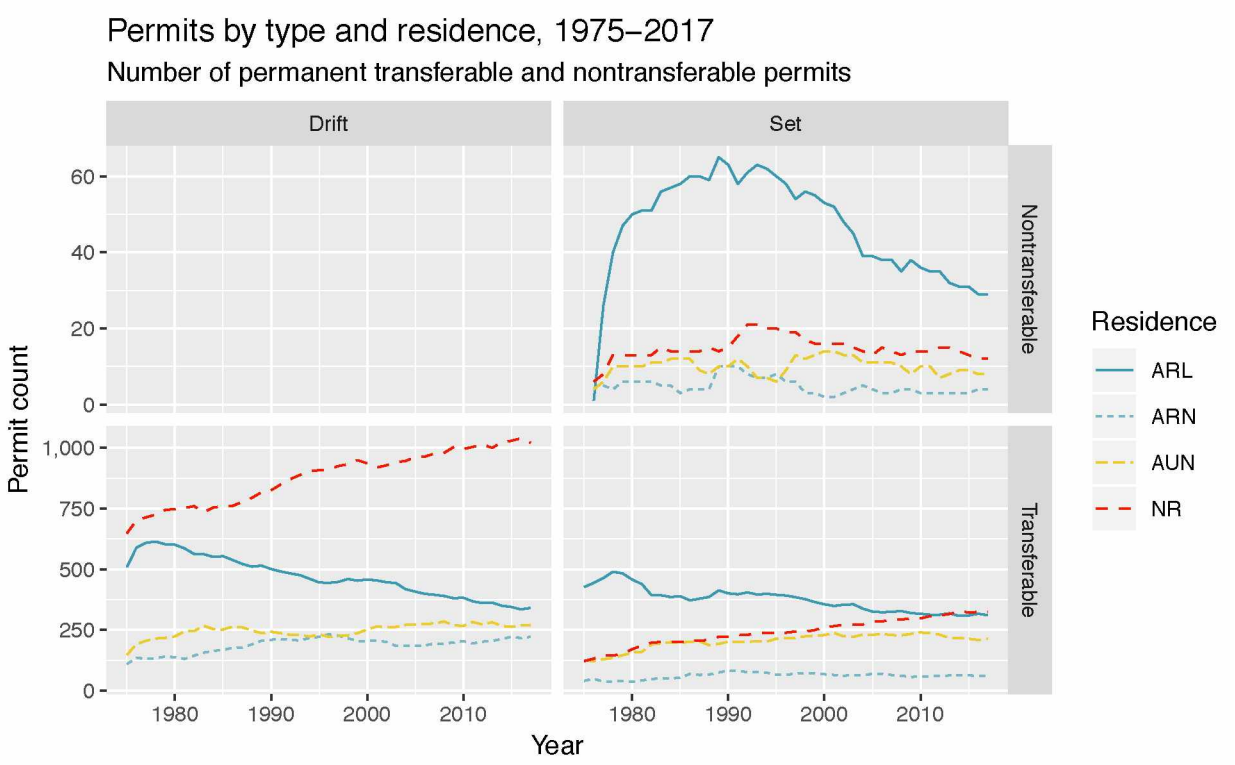

Figure 4.2. Number of permanent transferable and nontransferable permits issued in the drift and set gillnet fisheries by residence category, 1976-2017 (see text for details on permit transferability; Alaska Commercial Fisheries Entry Commission 2018a).

Permit loss has been consistent throughout the Bristol Bay region, but the magnitude and temporal patterns of loss vary between local communities. In other words, the vast majority of local communities have lost permits, but some have lost many and some have lost few, and a small number have increased their permit holdings. When permit holdings are scaled by population, ARL and ARN communities have experienced steep declines in permit holdings relative to AUN and NR communities since 1980 (earliest year that population data are available for most Alaskan communities; Figure 4.3). Sparseness of available population data notwithstanding, there is a clear downward trend in per capita permit holdings over the last 30 years for ARL and ARN communities. Per capita nonresident permit holdings have increased steadily in the drift fishery, while AUN permit holdings have increased in the set gillnet fishery.

[8] Alaska territorial representative Anthony Dimond successfully lobbied for a bill that permitted Bristol Bay residents (i.e., those having lived in the region for at least 2 years) to fish commercially using set gillnets (McCullough 2001).

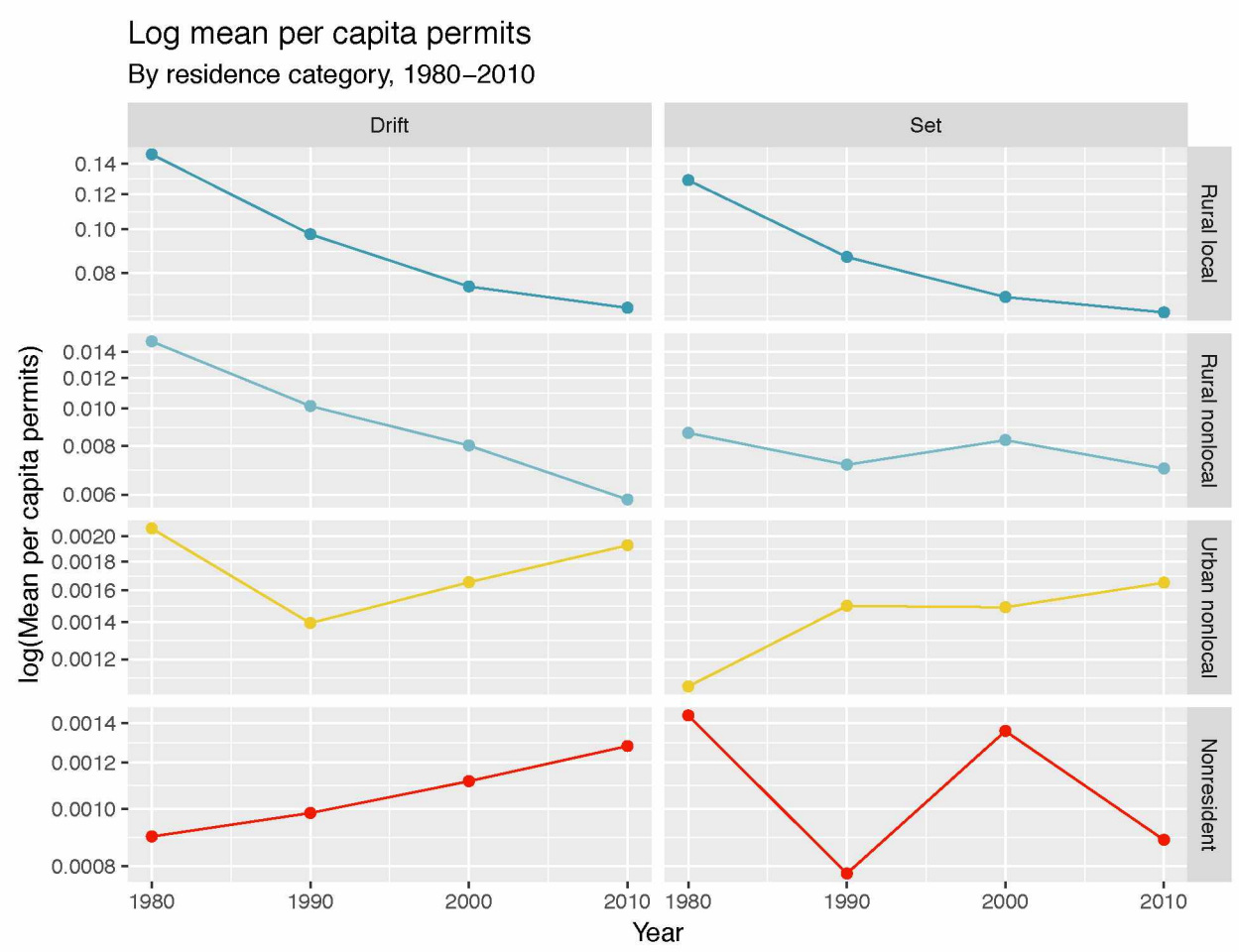

Figure 4.3. Log mean per capita permit holdings by permit holder residence category in the drift and set gillnet fisheries from 1980 to 2010. Alaska rural locals ("Rural local") are permit holders that reside in rural communities that are local to the fishery, Alaska rural nonlocals ("Rural nonlocal") reside in rural communities that are not local to the fishery, Alaska urban nonlocals ("Urban nonlocal") reside in urban communities that are not local to the fishery, and nonresidents reside in other US states or countries (Alaska Commercial Fisheries Entry Commission 2018a).

When comparing Alaskan communities only (for which accurate and temporally continuous population data are available from the State of Alaska Department of Labor), the downward trend in rural per capita permit holdings and stable (drift) or slightly upward (set) trends in urban per capita holdings are again evident (Figure 4.4). In the drift fishery, AUN per capita holdings have increased but leveled off in recent years, while ARL per capita permit holdings have decreased continuously since 1980. Between 1980 and the late 2000s, ARN holdings also decreased but have since stabilized. In the set gillnet fishery, ARN per capita permit holdings increased in the late 1990s but decreased again in the mid-2000s. Per capita AUN holdings increased until 2000, and decreased since 2010.

Decreases in per capita permit holdings are attributable to permit loss, population increase (of non-permit holding residents), or both. Nearly all ARL communities have grown in size since the 1970s, and

since 1990, 12 of 26 have increased in population, ten have decreased, and four have remained stable. The region-wide population has increased 52% since 1970, and 19% since 1990. In communities in the Dillingham Census Area, population growth is due to natural increase (i.e., births outnumber deaths) rather than net migration. In the Lake and Peninsula and Bristol Bay Boroughs, population decreases are largely due to net migration (i.e., emigrants outnumber immigrants). In Taken together, these population changes suggest that to some extent, decreases in per capita ARL permit holdings since the 1970s are a product of increasing population. There is a positive relationship between community population and cumulative net change in permit holdings; in other words, small communities—of which most are ARL communities—have lost permits over time or they have not gained as many permits to the extent that larger communities have (Figure 4.5).

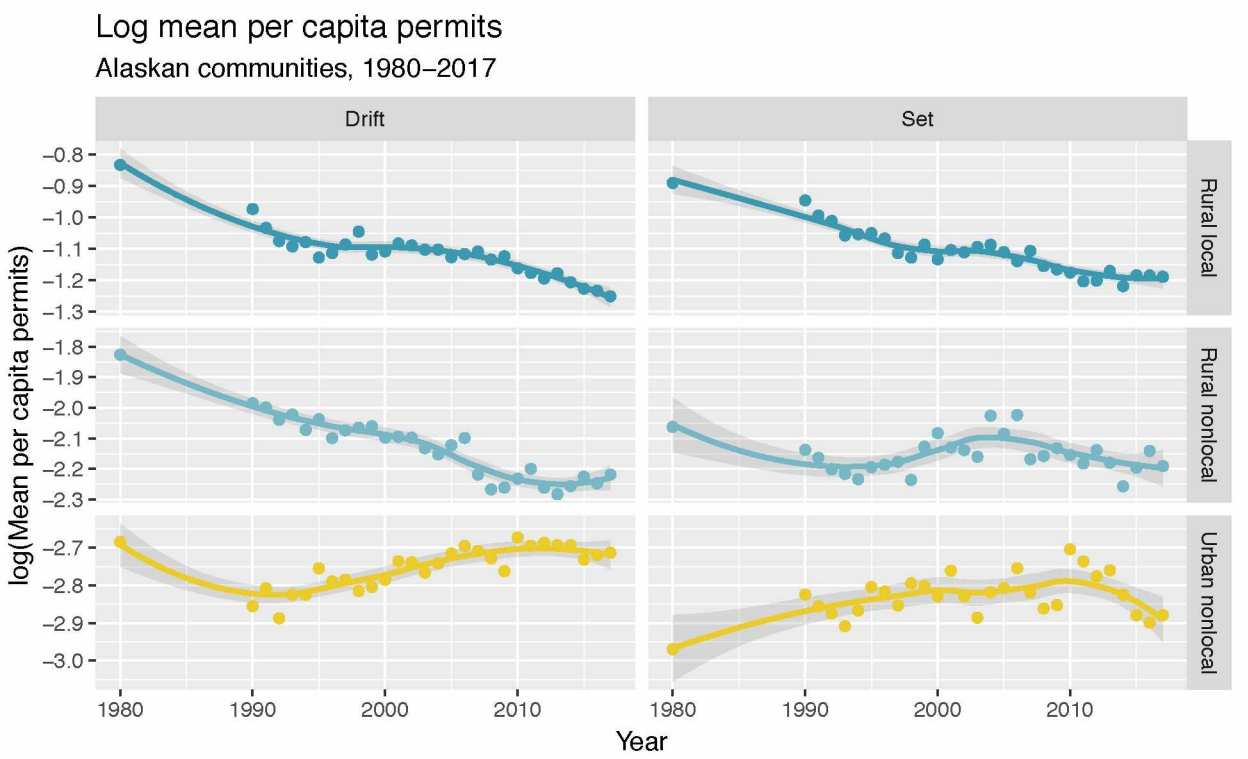

Figure 4.4. Log mean per capita permit holdings by residence category for Alaskan permit holders in the drift and set gillnet fisheries from 1980 to 2017. Alaska rural locals (ARL) are permit holders that reside in rural communities that are local to the fishery, Alaska rural nonlocals (ARN) reside in rural communities that are not local to the fishery, and Alaska urban nonlocals (AUN) reside in urban communities that are not local to the fishery. Residency is determined by affidavit provided by the permit holder to the Alaska Commercial Fisheries Entry Commission (Alaska Commercial Fisheries Entry Commission 2018a).

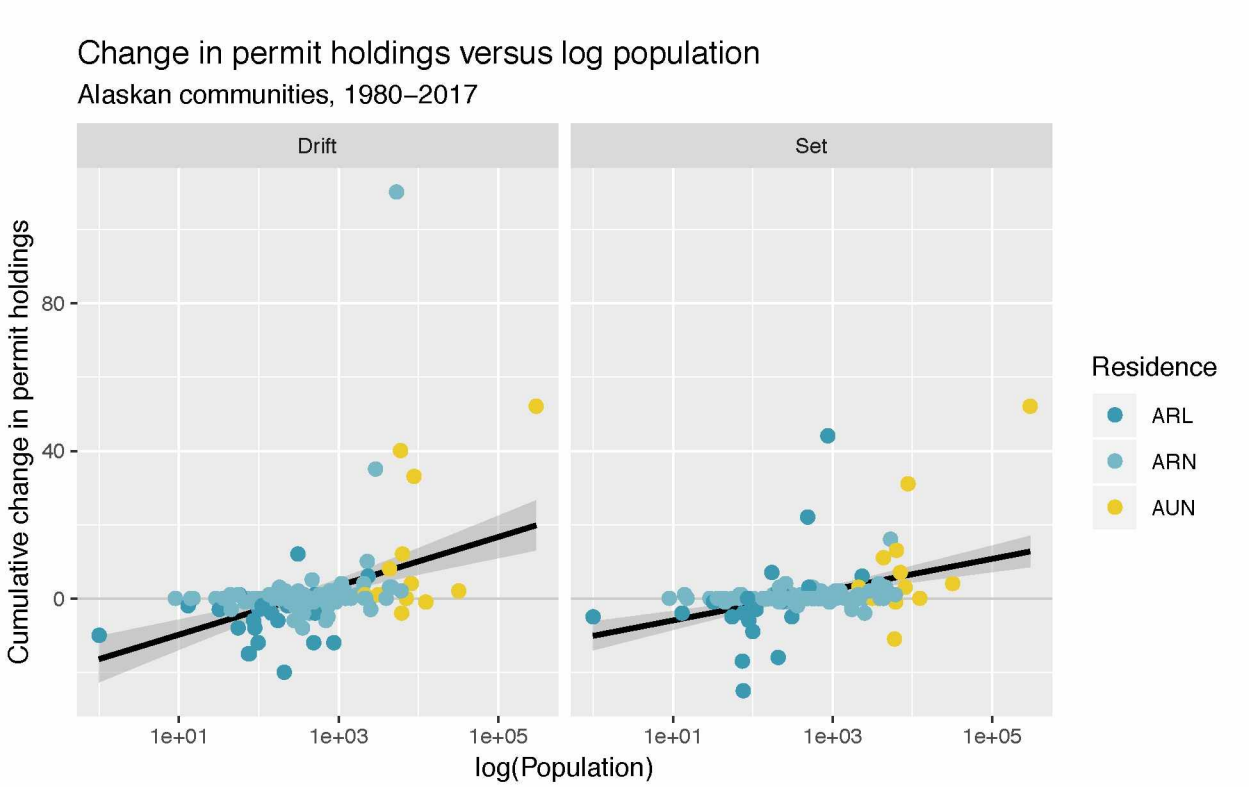

Figure 4.5. Cumulative change in permit holdings by residence category for Alaskan communities in the drift and set gillnet fisheries from 1980 to 2017. Alaska rural locals (ARL) are permit holders that reside in rural communities that are local to the fishery, Alaska rural nonlocals (ARN) reside in rural communities that are not local to the fishery, and Alaska urban nonlocals (AUN) reside in urban communities that are not local to the fishery. Residency is determined by affidavit provided by the permit holder to the Alaska Commercial Fisheries Entry Commission (Alaska Commercial Fisheries Entry Commission 2018a).

4.4.3. Permit loss through transfer, migration, cancellation, and foreclosure

Between 1975 and 2017, 140 set gillnet permits have been transferred from ARL communities to other residence categories (-21%; 140 of 660 permits). Most of the transfer activity that resulted in a net decrease in ARL set gillnet permit holdings occurred in the decade immediately after limited entry, when ARL losses due to transfer activity averaged 13.2 permits per year and totaled 132 by the end of 1984. Net gains have occurred in the ARN, AUN, and NR categories with the greatest net increase in NR set gillnet permit holdings (+62%) due to transfer (96 of 154 initially issued permits). Communities local to the Bristol Bay drift gillnet fishery (i.e., ARL) rank third in percent permit loss due to transfer among all salmon fisheries[9], behind the Prince William Sound set gillnet (-62%, 13 permit decrease since initial issuance) and Area M drift gillnet fisheries (-58%, 57 permit decrease since initial issuance). In total, 295 drift permits have been transferred from ARL to other residence categories, which represents a 41% net decrease from initial permit holdings (295 of 712 permits). In number of permits, Bristol Bay ranks first (drift gillnet) and second (set gillnet) among salmon fisheries in permit loss due to transfer. As of 2017, a net total of 149 drift permits have been transferred to nonresidents from Alaska residents since 1975 (a net NR increase of 20%; 149 of 745 permits). When considering all salmon fisheries[9], NRs have lost permits due to transfer activity (-5%, 105 of 1,974 initially issued permits), while ARNs have increased permit holdings due to transfer (+72%, 289 of 400 initially issued permits).

In the first 15 years after limited entry, ARL permit holdings in the drift fishery experienced a net increase due to migrations of permit holders into the Bristol Bay region (Figure 4.6). Since 1990, ARL drift permit holdings have net decreased by 16% due to migration (83 of 503 permits). During the same period, NR drift gillnet permit holdings experienced a net gain of 15% (126 of 831 permits). Declines due to migration in ARL set gillnet permit holdings began shortly after limited entry and have resulted in a net loss of 22% (146 of 660 permits) since initial issuance, which is lower than the total ARL migration losses for all salmon fisheries (-16%). Among all salmon fisheries in the state, migration has accounted for the greatest increases in permit holdings among AUN (+51%, 304 of 599 permits) and NR categories (+34%, 667 of 1,974 permits), and the greatest decreases in permit holdings among ARL (-16%, 797 of 5,085 permits) and AUL (-15%, 230 of 1,502 permits) since initial issuance.

[9] Excluding hand and power troll fisheries

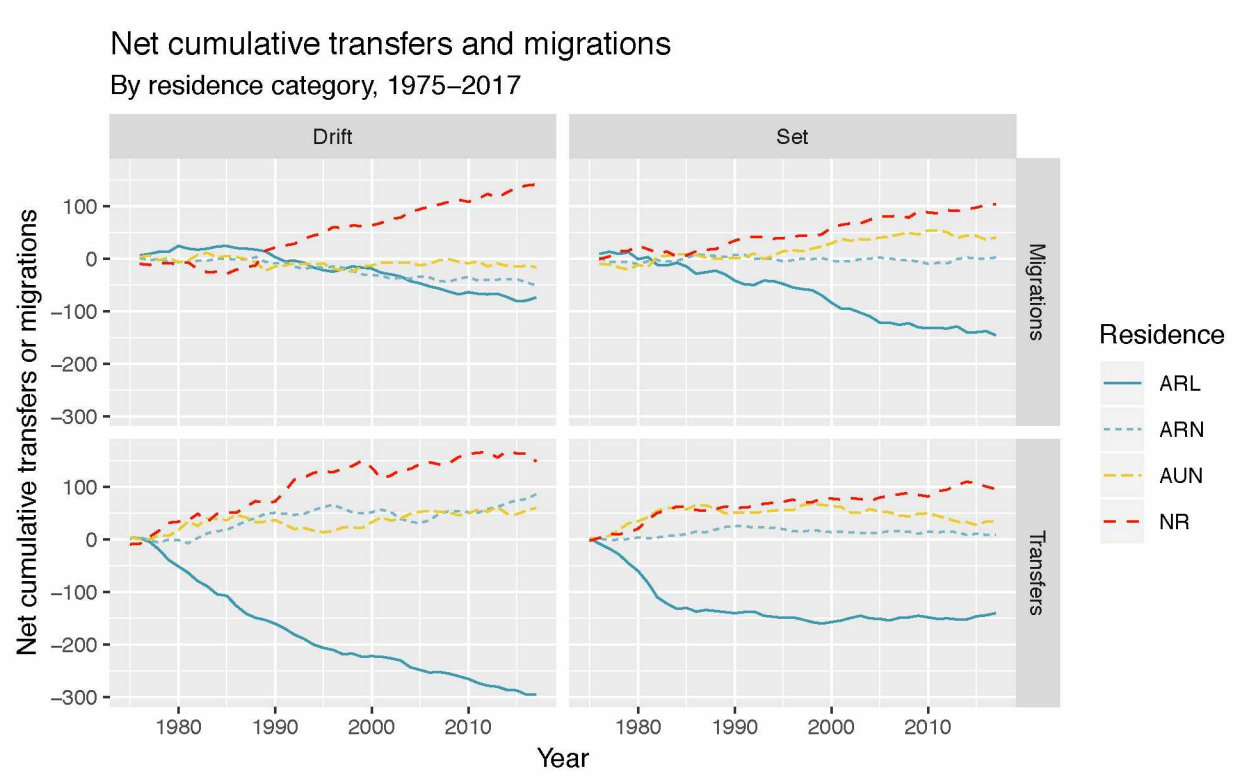

Figure 4.6. Net cumulative permit migrations and transfers by residence category for Alaskan permit holders in the drift and set gillnet fisheries from 1975 to 2017. Migrations occur when a permit holder moves from one community to another, while transfers occur when a permit is sold, gifted, or traded. The net total migrations and transfers for each residence category (in minus out) is summed on a cumulative basis across years. Alaska rural locals (ARL) are permit holders that reside in rural communities that are local to the fishery, Alaska rural nonlocals (ARN) reside in rural communities that are not local to the fishery, Alaska urban nonlocals (AUN) reside in urban communities that are not local to the fishery, and nonresidents (NR) reside in other US states or countries (Gho and Farrington 2018).

The cumulative number of cancelled drift permits is disproportionately large for ARLs (Figure 4.7). Currently, 46% of the cancellations in the drift fishery have been ARL permits, despite ARLs holding just 18% of all drift permits (341 of 1,863 permits). For comparison, nonresidents account for 36% of drift cancellations and 55% of drift permit holdings (1,029 of 1,863 permits). Drift permits have been canceled primarily through forfeit (i.e., non-payment of renewal fees for more than two consecutive years), although 16 of 25 forfeited drift permits were eventually reinstated. The number of drift and set gillnet permits cancelled spiked between 2002 and 2010, and has continued to climb in the set gillnet fishery. Similar to cancellation patterns in the drift fishery, there has been a disproportionately large number of ARL cancellations (48% of cancellations and 35% of 2017 permit holdings). The majority of cancellations in the set gillnet fishery (70%; 56 of 80 cancellations) are due to forfeit, followed by lapse of nontransferable permits (20%; 16 of 80 cancellations), relinquishment (7.5%; 6 of 80 permits), and administrative and criminal revocation (2.5%; 2 of 80 permits). Four of 38 canceled ARL set gillnet permits were eventually reinstated. Alaska rural permit holders have permanently lost 34 set gillnet

permits since 1975 due to cancellation, which represents a 5% loss from initial issuance (34 of 660 permits).

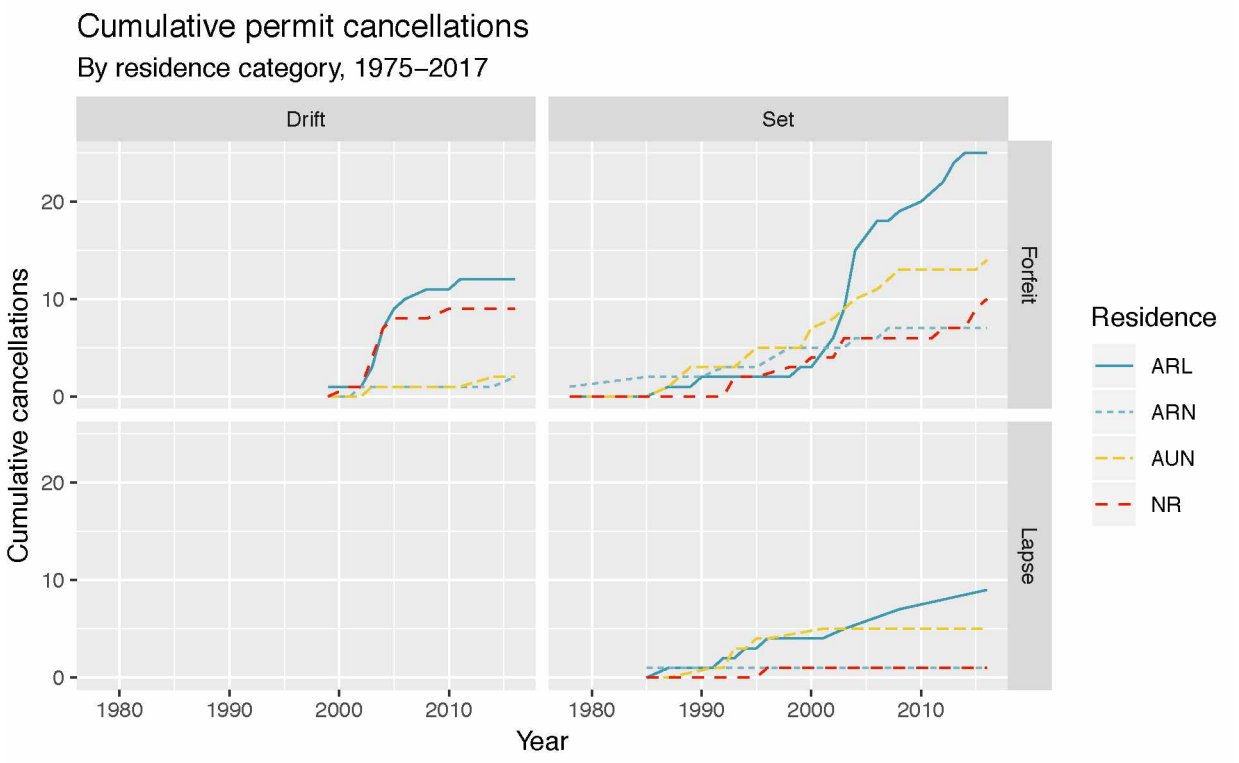

Figure 4.7. Net cumulative forfeits and lapses by residence category in the drift and set gillnet fisheries from 1975 to 2017. Forfeit occurs when a permit holder has not paid permit renewal fees for two consecutive years. Forfeited permits are able to be reinstated with good cause and back payment of renewal fees. Lapse occurs when the holder of a nontransferable permanent permit dies. Lapsed permits are permanently removed from the fishery. Alaska rural locals (ARL) are permit holders that reside in rural communities that are local to the fishery, Alaska rural nonlocals (ARN) reside in rural communities that are not local to the fishery, Alaska urban nonlocals (AUN) reside in urban communities that are not local to the fishery, and nonresidents (NR) reside in other US states or countries (Gho and Farrington 2018).

Permit foreclosures occur when a permit holder defaults a permit loan. The Department of Commerce, Community, and Economic Development and Commercial Fisheries and Agriculture Bank loan programs are only open to Alaska residents, and so the foreclosures shown above involve resident permit holders (except for a few rare cases in which loan program participants moved out of state). Between 2001 and 2018, mean annual foreclosure of drift and set gillnet permits increased two-fold for Alaska rural drift permit holders and four-fold for AUN drift and ARL set gillnet permit holders compared to the previous two decades (Figure 4.8). Although the overall number of foreclosures is relatively minimal (73 drift and 13 set gillnet), there appear to be two distinct period of foreclosure: immediately after the state permit loan program was modified in 1980 until 1990, and again from the early to mid-2000s.

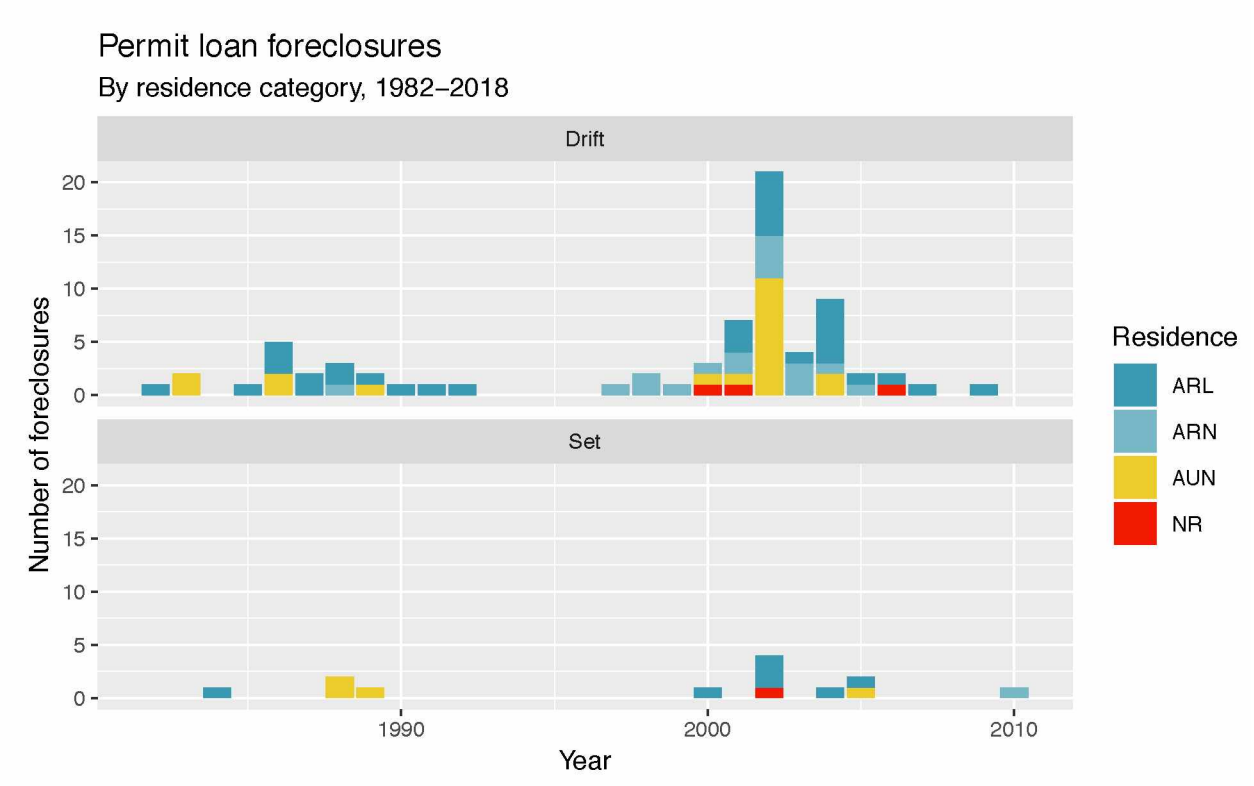

Figure 4.8. Number of permit foreclosures by residence category in the drift and set gillnet fisheries from 1982 to 2018. Permits are held by the Alaska Department of Commerce, Community, and Economic Development (state loan program defaults) or the Commercial Fisheries and Agriculture Bank (CFAB loan defaults) until they may be transferred back to the permit holder or transferred to a new permit holder. Alaska rural locals (ARL) are permit holders that reside in rural communities that are local to the fishery, Alaska rural nonlocals (ARN) reside in rural communities that are not local to the fishery, Alaska urban nonlocals (AUN) reside in urban communities that are not local to the fishery, and nonresidents (NR) reside in other US states or countries (Alaska Commercial Fisheries Entry Commission 2018a).

The method of coding transfers in the public permit holder database changed in 1994 so that emergency transfers and permanent transfers were more easily distinguishable. Prior to 1994, in some instances it is impossible to know whether a transfer was an emergency or permanent transfer. For this reason, transfer pairs that occurred from 1975 to 1993 are not described. In the drift fishery, ARLs transferred more permits to NRs than any other nonlocal residence category in most years (Figure 4.9). Although the trend in ARL-ARL (intra-category) or ARL-other (cross-category) transfers seems to be stable over time, this figure does not show the overall distribution of permits amongst residence categories and the decreasing share of permits held by ARLs. It appears that the number of intra- and cross-category transfers is not related to the share of permits held by ARLs. Nonresidents have largely transferred drift and set gillnet permits to other nonresidents, but permits transferred to Alaskans went mostly to Alaska urban nonlocals (Figure 4.10). In the set gillnet fishery, ARLs tend to transfer permits to other ARLs over other residence categories. Between 1994 and 2017, ARLs transferred on average 18

permits to other ARLs, 1.6 to ARNs, 3.5 to AUNs, and 2.9 set gillnet permits per year to NRs (Figure 4.11).

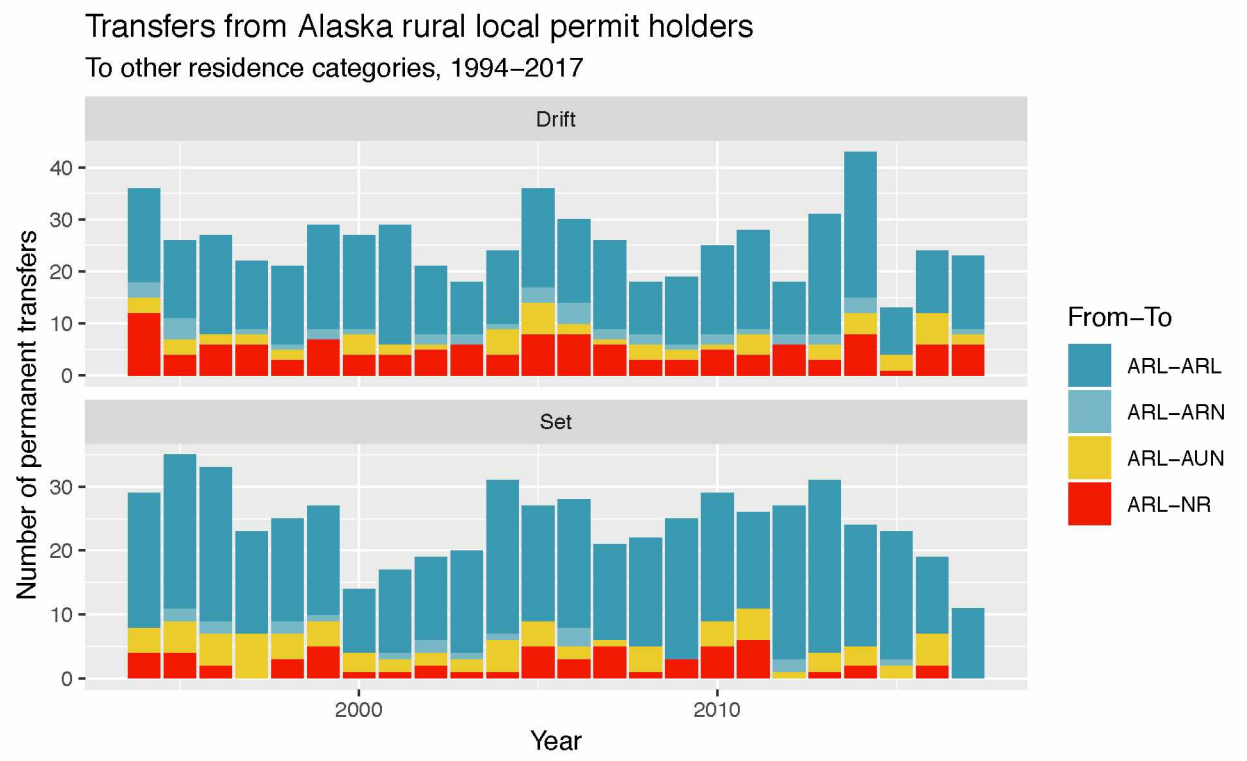

Figure 4.9. Number of permanent transfers from Alaska rural local permit holders to other residence categories in the drift and set gillnet fisheries from 1994 to 2017. Alaska rural locals (ARL) are permit holders that reside in rural communities that are local to the fishery, Alaska rural nonlocals (ARN) reside in rural communities that are not local to the fishery, Alaska urban nonlocals (AUN) reside in urban communities that are not local to the fishery, and nonresidents (NR) reside in other US states or countries. Permit holders whose residence category is unknown have been omitted (Alaska Commercial Fisheries Entry Commission 2018a).

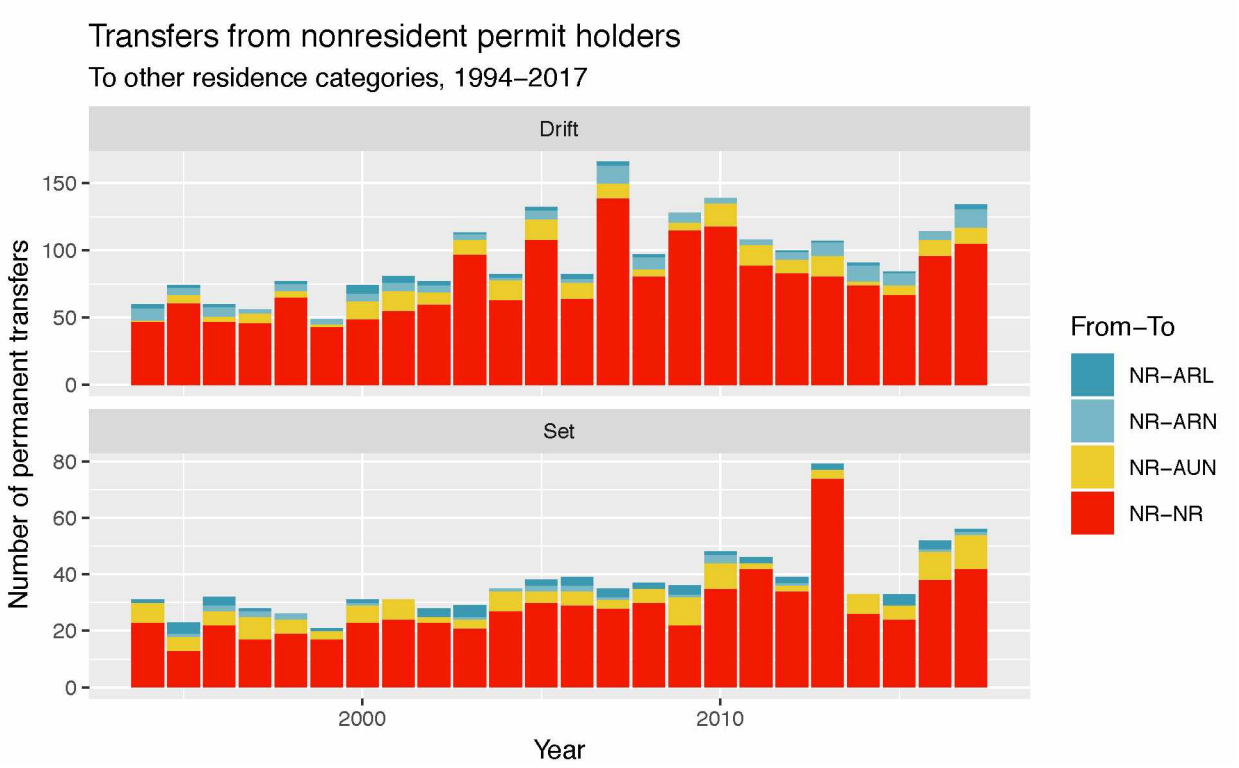

Figure 4.10. Number of permanent transfers from nonresident permit holders to other residence categories in the drift and set gillnet fisheries from 1994 to 2017. Alaska rural locals (ARL) are permit holders that reside in rural communities that are local to the fishery, Alaska rural nonlocals (ARN) reside in rural communities that are not local to the fishery, Alaska urban nonlocals (AUN) reside in urban communities that are not local to the fishery, and nonresidents (NR) reside in other US states or countries. Permit holders whose residence category is unknown have been omitted (Alaska Commercial Fisheries Entry Commission 2018a).

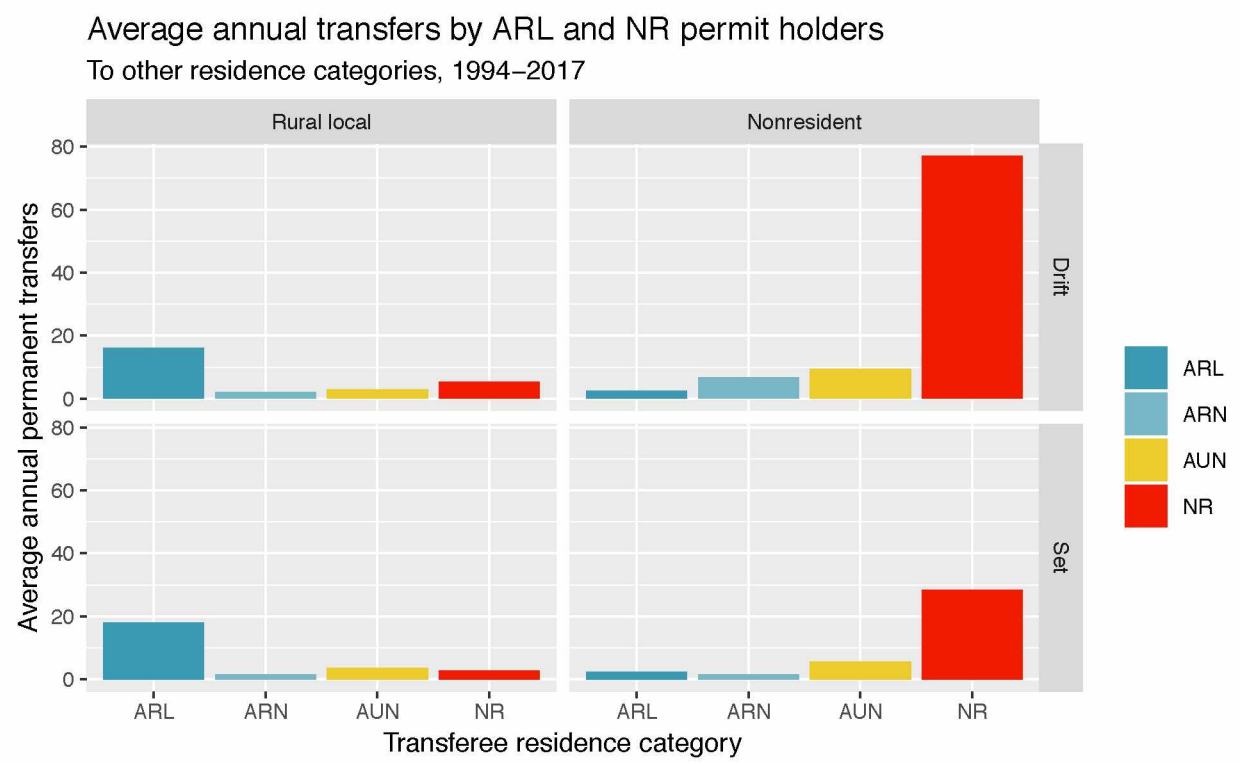

Figure 4.11. Average permanent transfers per year in the drift and set gillnet fisheries from Alaska rural local and nonresident permit holders to other residence categories, 1994-2017. Alaska rural locals (ARL) are permit holders that reside in rural communities that are local to the fishery, Alaska rural nonlocals (ARN) reside in rural communities that are not local to the fishery, Alaska urban nonlocals (AUN) reside in urban communities that are not local to the fishery, and nonresidents (NR) reside in other US states or countries. Permit holders whose residence category is unknown have been omitted (Alaska Commercial Fisheries Entry Commission 2018a).

4.4.4. Rate of new entry

The rate of new entry, defined as the number of first-time permit holders in a fishery divided by the total number of permit holders in each residence category, has consistently been lowest for ARLs in the drift fishery, with the exception of a few years in the late 1980s (Figure 4.12). In the years immediately following limited entry implementation, the rates of new entry among all residence categories were highest (up to 20%; Table 4.5). During the 2000s, the rate of new entry among ARLs declined while other residence categories saw moderate increases. In recent years, the rate of new entry among all residence categories has remained in the five to 10% range. In the set gillnet fishery, rates of new entry are similarly consistent, with ARLs entering the fishery at a lower rate than other residence categories. Rates of entry among all residence categories are slightly higher than in the drift fishery, ranging from about five to 15% since 1990.

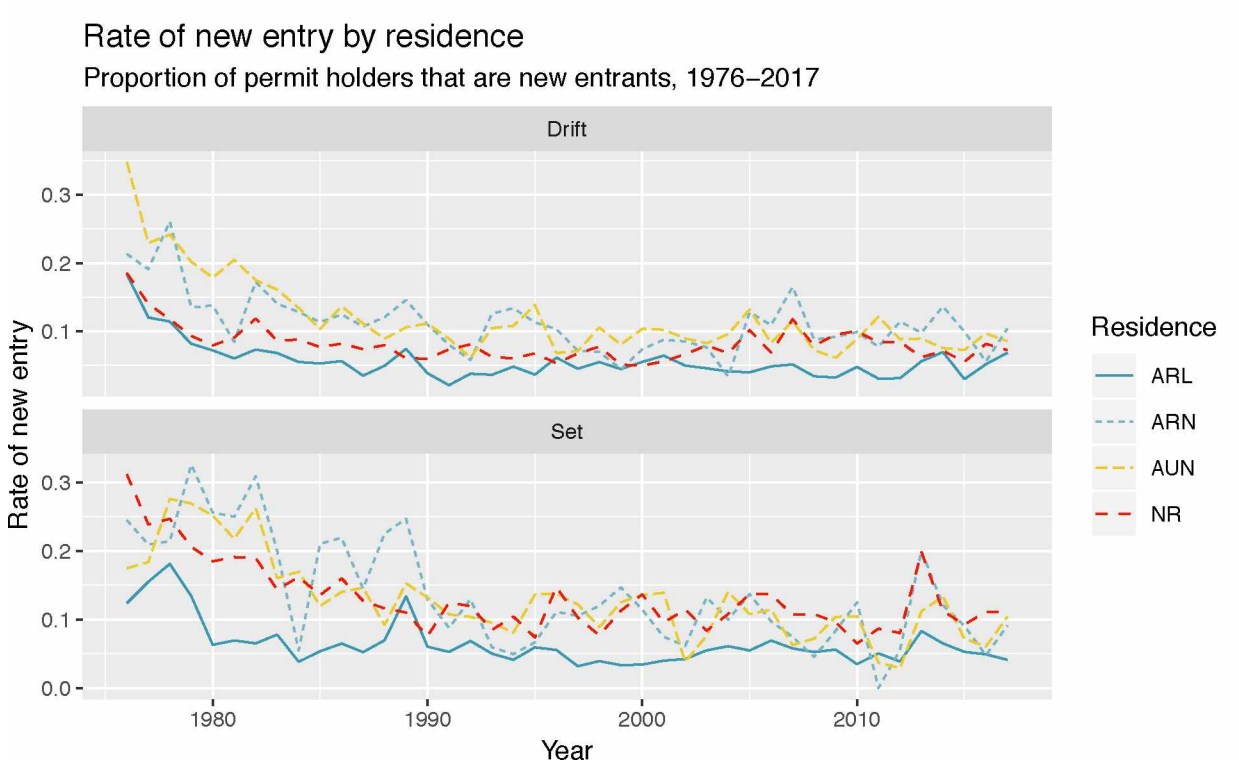

Figure 4.12. Rate of new entry by residence category in the drift and set gillnet fisheries from 1976 to 2017. Rate of new entry is calculated as the proportion of permit holders that are first-time permit holders. Alaska rural locals (ARL) are permit holders that reside in rural communities that are local to the fishery, Alaska rural nonlocals (ARN) reside in rural communities that are not local to the fishery, Alaska urban nonlocals (AUN) reside in urban communities that are not local to the fishery, and nonresidents (NR) reside in other US states or countries (Alaska Commercial Fisheries Entry Commission 2018a).

Table 4.5. Mean rate of new entry (1980–2017) by residence category in the drift and set gillnet fisheries (Alaska Commercial Fisheries Entry Commission 2018a).

Fishery	Residence category	Mean rate of new entry
Drift	Alaska rural local	4.8%
	Alaska rural nonlocal	10.0%
	Alaska urban nonlocal	10.3%
	Nonresident	7.4%
Set	Alaska rural local	5.5%
	Alaska rural nonlocal	12.3%
	Alaska urban nonlocal	11.6%
	Nonresident	11.6%

The relationship between rate of new entry and exvessel sockeye price in the previous year (i.e., lagged one year) differs among residence categories (Figure 4.13). As lagged exvessel price increases, new entry by Alaskans generally increases, whereas new entry by nonresidents decreases slightly or is

unchanged. The positive relationship, for the residence categories where it exists, is relatively stronger in the set gillnet fishery than in the drift fishery.

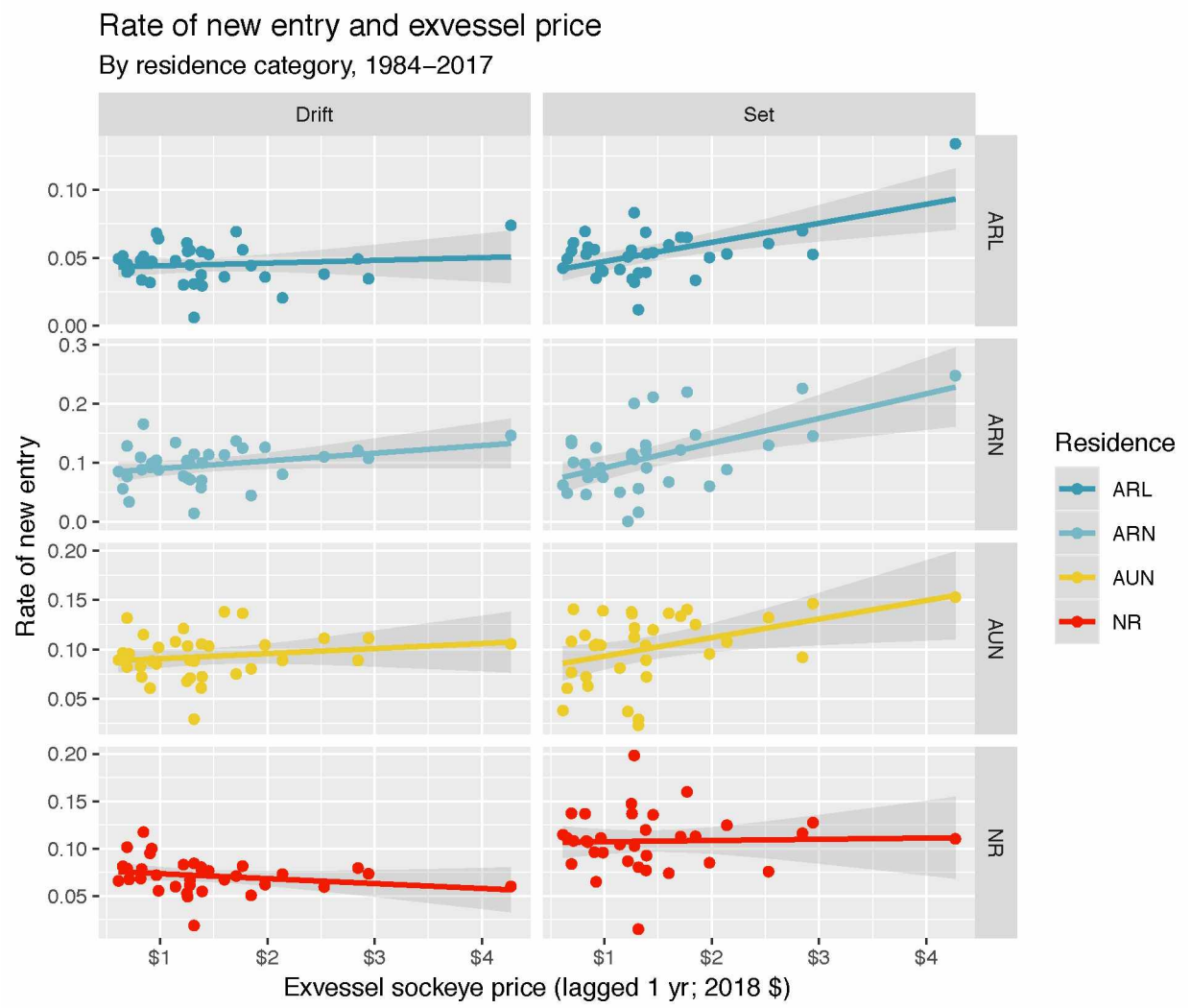

Figure 4.13. Rate of new entry versus lagged exvessel price from 1984 to 2017. Rate of new entry at time t corresponds to exvessel sockeye price at time $t - 1$. Estimated exvessel price has been adjusted for inflation using the Anchorage Consumer Price Index. Alaska rural locals (ARL) are permit holders that reside in rural communities that are local to the fishery, Alaska rural nonlocals (ARN) reside in rural communities that are not local to the fishery, Alaska urban nonlocals (AUN) reside in urban communities that are not local to the fishery, and nonresidents (NR) reside in other US states or countries (Alaska Department of Fish and Game 2018b).

4.4.5. Age demographics of permit holders by residence and community

The average age of drift permit holders was lowest in the early 1980s (40.4 to 43.9 years) and increased steadily for all residence categories until the mid-2000s (Figure 4.14). The trend then continued upward for ARLs, leveled off for AUNs, and decreased for ARNs and NRs. The maximum increase in age varied among residence categories, with ARL permit holders experiencing an increase of 10.7 years and nonresidents increasing by 5.6 years. Alaska rural locals are, on average, older than other residence categories and are continuing to increase in age while other categories remain stable or are decreasing in age. Mean age in the set gillnet fishery was lowest in the late 1970s, at which point ARLs were oldest at 35.9 years of age, and NRs were youngest at 32.4 years of age. Average age has since increased for all residence categories, although NRs have remained stable since 2000. Alaskan residents were oldest in 2017 (ARL = 46.4, ARN = 49.8) or 2016 (AUN = 46.3), which represents an increase in average age of ten or more years since the 1970s. Nonresidents have also increased in age by about ten years, but are still on average three years younger than Alaskan permit holders.

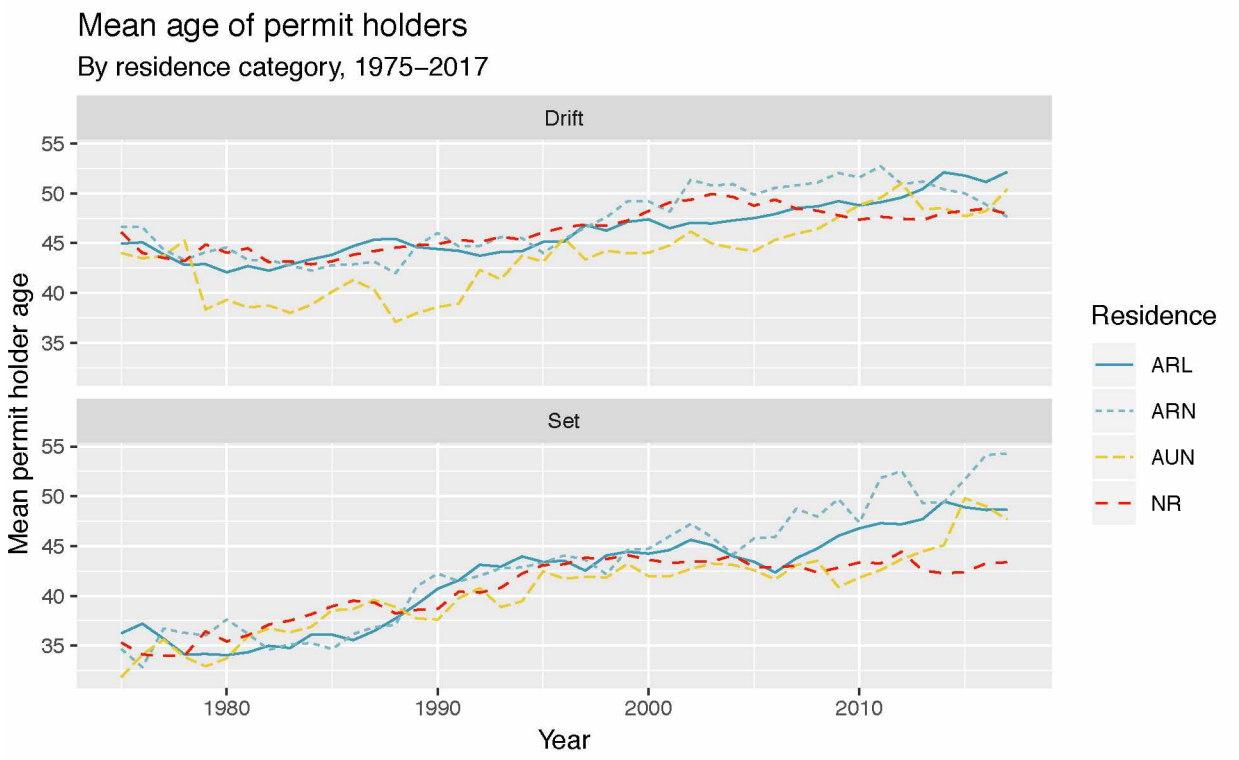

Figure 4.14. Mean permit holder age by residence category in the drift and set gillnet fisheries from 1975 to 2017. Alaska rural locals (ARL) are permit holders that reside in rural communities that are local to the fishery, Alaska rural nonlocals (ARN) reside in rural communities that are not local to the fishery, Alaska urban nonlocals (AUN) reside in urban communities that are not local to the fishery, and nonresidents (NR) reside in other US states or countries (Gho and Farrington 2018).

Age distribution of permit holders has shifted due to 1) aging of present permit holders, and 2) age-at-entry and exit of permit holders. Until the early 2000s, those under 40 made up the majority of permit

holders living in Bristol Bay communities. As the total number of ARL permit holders decreased, even fewer of those permit holders were under 40 years of age. In the drift gillnet fishery, the number of ARL permit holders under 40 decreased by 20.4% between 1980 and 2017 (greatest proportional loss); under-40 ARN permit holders have increased by 8.5% (Figure 4.15). Similarly, the number of set gillnet permit holders under 40 decreased between 1980 and 2017 for all residence categories, with losses ranging from -17% (NR) to -39.4% (ARN). The largest gains have been in the over-60 age group. Currently, 26% of NR permit holders in the drift fishery are over the age of 60.

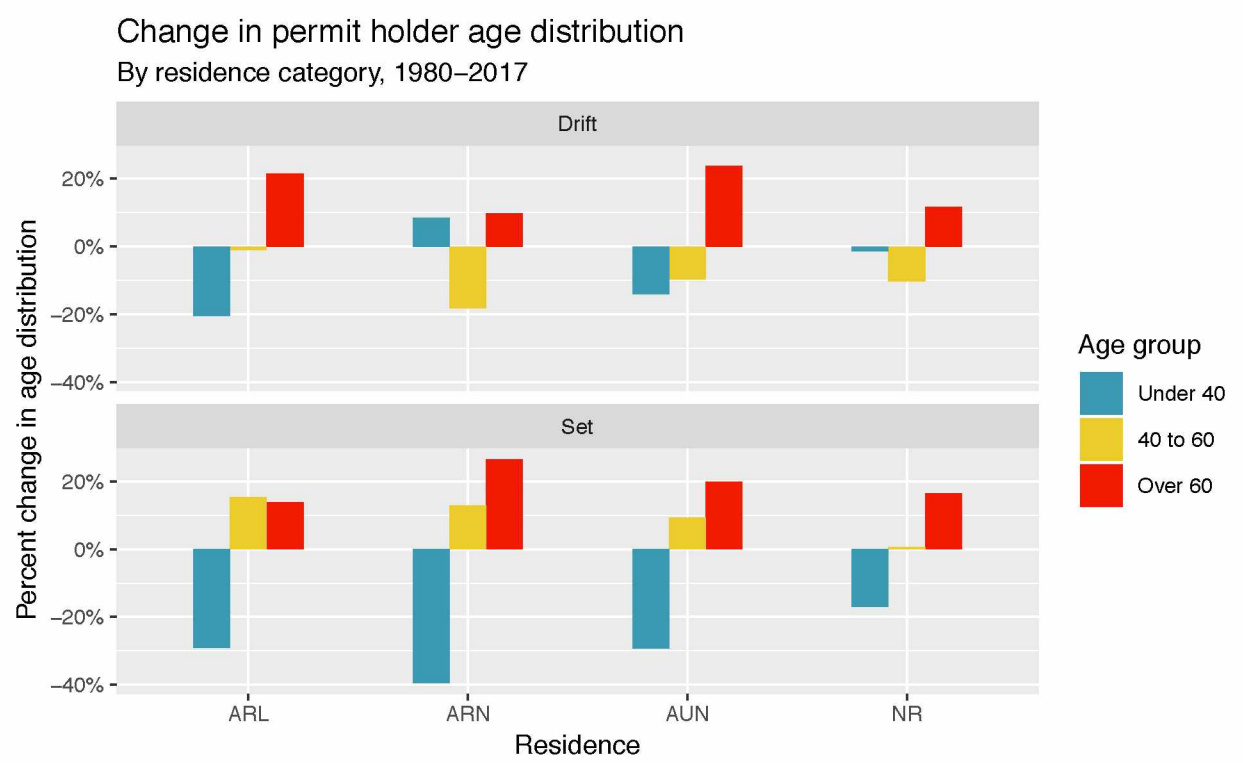

Figure 4.15. Percent change in the age distribution of permit holders by residence category in the drift and set gillnet fisheries from 1980 to 2017. Alaska rural locals (ARL) are permit holders that reside in rural communities that are local to the fishery, Alaska rural nonlocals (ARN) reside in rural communities that are not local to the fishery, Alaska urban nonlocals (AUN) reside in urban communities that are not local to the fishery, and nonresidents (NR) reside in other US states or countries (Alaska Commercial Fisheries Entry Commission 2018b).

4.5. Discussion

4.5.1. Per capita permit holdings

The loss of permits among Bristol Bay communities was one of the most significant changes in the region to emerge from the ethnographic data. Veteran fishermen and community leaders described the sale of permits and relocation of permit holders outside of Bristol Bay as a widespread problem, but as being more pervasive in smaller communities. This perception is comprised of two observations: 1) that permits have moved from ARL to ARN, AUN, and NR residence categories, and 2) that permit losses have been more severe in smaller Bristol Bay communities. To the first point, Alaska rural local communities have experienced consistent declines in per capita permit holdings relative to other residence categories in both the drift and set gillnet fisheries (see also *Permit loss through transfer, migration, and cancellation*). At the same time, nonresident per capita permit holdings have increased in the drift fishery, but have decreased slightly over time in the set gillnet fishery. This rural-to-urban and rural-to-nonresident trend in permit holdings has been described previously for Bristol Bay fisheries, as well as other limited entry fisheries.

To the second point, permit losses have been more severe in smaller Bristol Bay communities than in larger communities. For every 100% increase in population size, the cumulative change in permit holdings between 1975 and 2017 increased by 1.2 permits in the drift fishery and 3.7 permits in the set gillnet fishery. For instance, the expected change in set gillnet permit holdings would be 3.7 permits greater in a community of 1,000 people compared to a community of 500 people. The moderate effect of population on permit holdings is evidence that the problem of permit loss does not affect all communities equally. Losing a permit from a small community represents the loss of an income-providing opportunity in a place where jobs are scarce; for example, Northern Economics (2009) reported that local permit holders accounted for 90% of the dollars spent on income to local fishermen and 60% of the expenditures on transportation and food purchased within the region. Additionally, when very few permits remain in a community, the opportunities for youth to engage in commercial fishing and learn the skills, values, practices, and ethics of fishing disappear with each additional loss of a permit. An interviewee described this situation from the perspective of a young person:

> [If I'm] from the village…and [I] wanna go fishing but [I] don't know anybody to go fishing with, because there's only one guy in the village [with a permit], and he's taking his two kids out, and [my uncle] and my mom and dad—they all sold their permits 15 years ago, so how am I going to do it? (Drift gillnet fisherman and community leader, 23 Sept 2015)

4.5.2. Permit loss through transfer, migration, and cancellation

Nearly 300 drift gillnet permits have been transferred from ARLs to other residence categories since 1975 (a 41% decrease). As is shown by the cumulative shifts in permit holdings due to transfer among residence categories (Figure 4.6), roughly two-thirds of the ARL permits that have been lost were

already gone by 1994. The data used in this analysis are unable to capture the ARL permit losses that occurred immediately after limited entry was implemented. However, this early period of significant permit loss is well documented in the ethnographic data. Many veteran fishermen recalled local permit holders who—without realizing the long-term implications of doing so—sold permits to nonlocal fishermen. In other cases, local permit holders knew that selling the permit meant that they were unlikely to be able to buy in again at a later date but had no choice, as the permit was one of few assets that local families held during that time:

> They didn't really [realize] the value of the permits at that point in time. If you're a resident out here, and you're Native…there's only two things that you have that are worth anything. And that is a setnet/drift permit, or a Native allotment[10]. The rest of your assets are meaningless. So that's the two things, and when you have a bad fishing season, and you have six kids at home, and you haven't made any money, what's the alternative? Sell part of the Native allotment or sell the permit? And a lot of people had to sell their permits to sustain their families. (Drift gillnet fisherman, 22 Sept 2015)

Transferability of permanent permits is and will likely continue to be an important mechanism of permit loss among Bristol Bay communities. From an economic perspective, transferable permanent permits—of which all drift and 89% of set gillnet permits are—allow less efficient fishermen to sell their permit, and more efficient fishermen to purchase permits, maximizing the fleet-wide efficiency of harvest in the fishery (Soliman, 2014). From a social and livelihood perspective, transferability allows for intergenerational transmission of knowledge, skills, and values, as well as vessels, gear, and rights, without the prospective fisherman having to be born into a fishing family or a lottery-winner (in the case where permits revert to the state after a fisherman retires). Transferability, thus, is a double-edged sword. Free transferability of fishing rights from one individual to another by gift, sale, or trade is the mechanism by which most permits have left Bristol Bay communities. A permit holder wishing to sell their permit would—before it was widely known how severe the problem of permit loss from Bristol Bay was—usually sell to the highest bidder, who was usually not a local resident:

> People—even people that were you would think they would have some kind of social conscience about this. They went and sold their permit. I had this conversation with this one guy…'You live in this town, why didn't you sell it to a local person?' To me, that's unexcusable [sic]. (Set gillnet fisherman, 24 Sept 2015)

There is some recognition today of the importance of "selling permits local", but local permit loss via transfer continues despite the growing taboo.

The quantitative data also show that permit holders tend to transfer permits within their own residence category. Alaska rural locals generally transfer to other ARLs, but when they don't, they transfer to nonresidents, followed by urban nonlocals and rural nonlocals. Very seldom have permits been transferred from NR to ARL, or any Alaska resident category for that matter. This trend affirms the

[10] As part of the Alaska Native Claims Settlement Act, village corporations allocated land parcels to their shareholders. These parcels are referred to as "Native allotments".

ethnographic finding that there is a unidirectional flow of fishing rights away from local communities (and more broadly, away from Alaska). The tendency of permit holders to transfer within their residence category was also described by Oakley (1989). One of the explicit purposes for limitation of Alaska's fisheries was to retain fishery access in the hands of Alaskans, but the qualitative and quantitative data both suggest that this policy objective has not been met for the Bristol Bay salmon fisheries (Gilbertsen, 2004; Morehouse & Hession, 1972). Since 1980, resident permit holdings for all salmon fisheries has increased by four percent due to transfer activity, while resident permit holdings of Bristol Bay permits have decreased by 12% due to transfer activity (Gho & Farrington, 2018).

In addition to losses from transfer activity, 74 drift and 146 set gillnet permits (16% total of initially issued permits; 220 of 1,372) have been lost due to migration of rural local permit holders to nonlocal communities. In the set gillnet fishery, migrations have resulted in a 22% decrease in permit holdings since initial issuance (146 of 660 permits). Bristol Bay is unique among fisheries in Alaska because of its extremely short season, which allows nonlocals to spend three or four weeks per year participating in the fishery (locals tend to fish slightly longer, into mid-August). The short season also makes it possible for people to move away from Bristol Bay with their permits and return seasonally to fish. The effects of permit holder emigration on the community become clearer after the fishing season ends: fewer businesses remain open to service the community through the winter (e.g., shops, restaurants, mechanics, welders), fewer students in local schools reduce funding and threaten school closure, and fewer people are available to fulfill political and volunteer service needs (e.g., fire fighters, school board, zoning board). Taken together, these effects can lead to the loss of social cohesion and viability, fishing identity, and language in the community (Harling Stalker & Phyne, 2014; Stockdale, 2004).

Foreclosures are another means by which permits have been lost from Bristol Bay communities. Oakley (1989) found that between 1980 and 1988, Bristol Bay drift permits were used as loan collateral more often than any other fishery permit, and accounted for the greatest amount of original principal. Also during this period, twenty-five percent of loans[11] were used by residents of other regions of Alaska to purchase Bristol Bay permits (e.g., Juneau resident uses a loan to purchase Bristol Bay drift gillnet permit). For all but three fisheries, the state loan program helped curb permit loss among ARL communities; one of the three was the Bristol Bay drift gillnet fishery. Roughly a decade after Oakley's study, a large increase in the number of permit loan foreclosures occurred. The "disaster years", which were commonly referred to by interview participants, were from 1997 to about 2009, and were characterized by record-low exvessel prices for Bristol Bay sockeye salmon and multiple years of run

[11] This statistic refers to Section A loans, which are only for permit purchases; details at https://www.commerce.alaska.gov/web/ded/FIN/LoanPrograms/CommercialFishingLoanProgram/LimitedEntryPermitPurchase.aspx

failures in the Naknek-Kvichak district. This period is significant for a number of reasons, and was remembered often as time of hardship, uncertainty, and tough decisions for local fishermen (Donkersloot, 2005, 2007):

> We left Naknek in 1998 and moved over to Cordova. And it was such a crazy time then, because I got my permit in 1996 and then the disaster run happened in 1997, and everything changed after that. (Set gillnet fisherman, 21 Apr 2015)

> It's always an up-and-down cycle. There's always been up-and-down cycles. You've got to assume it's going to go back up…But, I don't know, people didn't at that point. I mean, the talk around here was unbelievable. It was like the whole fishery had died and was never going to come back. (Drift gillnet fisherman, 5 October 2014)

Several quantitative metrics also exhibited significant changes throughout the disaster years, including spikes in permit foreclosures and cancellations that occurred in both the drift and set gillnet fisheries.

Permanent permit cancellations have disproportionately impacted Alaska rural local permit holdings. That is, the rate of cancellations is highest for ARLs. Since 1975, 435 permits have been transferred out of ARL communities (295 drift, 140 set), compared to 42 cancelled permits (13 drift, 29 set)[12]. Although the problem of permit cancellation might not seem on the surface to be significant, there are important differences between a permit lost through transfer and one lost through cancellation. First, there are usually challenging or unexpected circumstances that lead to permit cancellation (e.g., financial hardship, family dysfunction, substance abuse, crime) and the loss of a permit in this way can have negative emotional as well as financial impacts on the permit holder and their family. Second, the permit holder is not financially compensated for a cancelled permit. This can add further and lasting trauma to an already distressing set of circumstances that lead to the cancellation in the first place. Finally, a cancelled permit—unless it is reinstated later—will never be repatriated. In the case of a permit transferred away from ARL communities, institutional support like BBEDC's Permit Loan Program can in theory bring permits back to ARL communities. If a permit reaches "forfeit" status, however, it is often too late to save that permit.

The extent to which cancellations have contributed to local permit loss in Bristol Bay and elsewhere is concerning, but still not fully understood. This study found that recent rates of drift permit cancellations are higher for ARLs than for other residence categories (3.8% in 2017), and set gillnet permit cancellations for ARL permit holders are second only to ARN permit holder cancellations (ARL cancellations = 11.2%, ARN cancellations = 13.4% in 2017; Gho and Farrington 2018). Low exvessel prices during the early 2000s clearly had a significant impact on permit cancellations, particularly for ARL and NR drift permit holders and ARL and AUN set gillnet permit holders. Similarly severe ARL losses due to cancellation have occurred in the Kuskokwim River, Lower and Upper Yukon River, Norton

[12] Eleven ARL drift permits and four ARL set gillnet permits have been reinstated.

Sound, and Kotzebue Sound gillnet fisheries (e.g., -14%; 95 of 662 initially issued permits in the Kuskokwim gillnet fishery). In contrast, cancellations have accounted for zero to two percent of initially issued permits in the Prince William Sound, Cook Inlet, Southeast, Chignik, and Area M fisheries. Although cancellations and nontransferable permits were not an emergent theme from the ethnographic data, an interview participant suggested that a large number of nontransferable permits were issued as the result of a 1975 court case in which CFEC was ordered to review applications by Alaska Native fishermen "who [were] unable to substantially complete an application for a limited entry permit by the 1975 deadline because of lack of education, inability to speak English, residence in a remote Alaskan location, poverty or cultural barriers"[13]:

> So my mom [has a nontransferable permit as a result of the Wassillie settlement] and that will—when she passes away—God willing, it's not for a very long time—it will go away with her. Because the interim permits don't—they weren't meant to [be passed on]. (Set gillnet fisherman, 2 Oct 2014)

Despite the individual- and family-level consequences of current and future cancellations documented in this study, the unequal distribution of nontransferable permits and cancellations—between Western Alaska and Bristol Bay fisheries on one hand and Southcentral and Southeast Alaska fisheries on the other—and its impacts have not been examined in depth.

Uncertainty also looms about the permits that will be lost due to lapse in the coming years. Since 1975, 158 nontransferable set gillnet permits have been issued, 65 of which were issued to ARL permit holders (Gho, 2015). In an effort to increase local participation in the fishery, the CFEC issued nontransferable permits to those who did not initially qualify for a transferable permanent permit through the fishing history/economic hardship-based points system. From our ethnographic data, we know that many children were issued nontransferable permits (as young as 10 years old). These young initial issues in 1975 are now 55 to 70 years old, and there is palpable concern about the loss that those permits represent in terms of intergenerational transfer of fishing knowledge, cultural reproduction, and access opportunities for new fishermen. The daughter of a nontransferable permit holder described the implications of cancellations for the next generation of fishermen:

> Yeah, so we're getting to a point where a lot of the people who were issued those non-transferable permits are in their 50s and 60s now and so there's gonna be quite a few permits that go away here shortly…So that is one barrier to young people who are fishing, right now…maybe if they're working for their dad, [and] there's not a transferable permit in the family. (Set gillnet fisherman, 21 Sept 2015)

Nine nontransferable set gillnet permits have lapsed (meaning the holder of that permit has retired from fishing or died) and there remain 29 permits that will disappear as nontransferable permit holders retire or die. These permits could also be cancelled for other reasons before the permit holder retires or dies. No matter the reason, over the coming years, the current number of ARL set gillnet permits that have been

[13] (*Riley v. Simon*, 1990).

cancelled to date will nearly double, thereby decreasing ARL set gillnet permit holdings by, at a minimum, an additional 8.5% (29 of 340 permits).

4.5.3. New entry

Among residence categories, ARLs consistently have the lowest rates of new entry in both the drift and set gillnet fisheries (mean ARL drift = 4.8%; mean ARL set = 5.5%). Rates of new entry peaked in the late 1970s and early 1980s, in part because those fishermen that were initially issued rights and close to retirement anyway sold their permits early, not knowing what the new management system would mean for their fishing operation or the value of their permit (Langdon, 1980). In 2000, the beginning of the disaster years, the rates of new entry began to increase slightly for all but ARLs. In the set gillnet fishery, this period saw one- or two-year drops in new entry for all categories except ARLs, but rates of new entry remained relatively stable until the end of the disaster years. From 2005 to 2015, rates of new entry into the drift fishery were generally lower than they were before 2004. Fishermen who grew up fishing during the disaster years, and who would have been in a position to buy permits and fishing operations at age 30 or so between 2005 to 2015, may have opted not to fish or delay entry into the fishery because of the biological and economic uncertainty of the fishery during the disaster years (Donkersloot, 2005).

Rates of new entry among ARLs have been consistent, even throughout the disaster years when permit holders in all other residence categories were turning over permits at higher rates. It is possible that locals do not sell as readily as nonlocals because monetary opportunity costs are lower for the former, given the limited availability of alternative employment in the region. In addition to entry decisions driven by the need for cash income, the ethnographic results strongly suggest that decision-making in the context of fishing and of living in the region is driven by many non-monetary benefits, including self-employment, time spent with family, working outdoors, and living in a small, close-knit community. According to one veteran fisherman:

> Nobody should go into fishing for the money. It's absolutely—if you don't love what you're doing, it's way too hard of work. (Drift gillnet fisherman, 5 Oct 2014)

The ethnographic data show that people sell a permit or move away, not necessarily because the opportunities to do something else or to live somewhere else are better, but because their adaptive strategies have been constricted by the large capital requirements of participating in privatized fisheries (Coulthard, 2012). Local people saw the disaster years as a storm to be weathered, and they drew upon the support of their families and communities until it couldn't be weathered anymore (Hébert, 2015). Nonlocal permit holders may share this sentiment, but given the higher rate of new entry among nonlocals during the disaster years, permit holders may have viewed the low prices as an opportunity to retire or to

invest their capital elsewhere. Accordingly, nonresident permit holders tend to enter the fishery at lower rates when fish prices and permit values are high.

The high cost of entry, of which a limited entry permit is a large part, by itself is not related to rates of new entry. On the other hand, exvessel sockeye price is highly correlated with new entry in both the set and drift gillnet fisheries. This study found that the strength of this relationship is dependent on resident category; there is virtually no change in rate of new entry for nonresidents given an increase in exvessel price. One of the most significant themes to emerge from the ethnographic results was the high costs of getting into fishing today. Fishermen who entered the fishery in the late 1970s when entry was relatively affordable, however, also emphasized that today's high costs of entry would be manageable but for the current exvessel price of fish:

> There just doesn't seem to be any reason to do this for the rate of return right now…The banks will loan you money on a boat, if you have enough of a down payment. I don't know. I don't think getting into right now—until there's some kind of price stability—makes any sense at all. (Drift gillnet fisherman, 23 Sept 2015)

Permit values are not as strongly correlated with rates of new entry as are exvessel permit prices. A possible explanation for this is that a new permit holder must take on a significant amount of debt, no matter the present permit value. Entering a fishery when expected earnings are greater—even with a higher debt load—may seem to a prospective permit holder more favorable than taking on a slightly lower debt when permit values are lower. When permit values and exvessel values are both low, there is a risk that initial earnings will not cover debt service on vessel and permits loans and cash costs associated with fishing. Essentially, we see indications from the quantitative data but no evidence from the qualitative data from this or other studies about precisely what motivates fishermen to overcome the financial barriers to entry into commercial fishing.

4.5.4. Permit holder age demographics

On average, all permit holders have increased in age since the mid-1980s in the drift fishery and since 1975 in the set gillnet fishery. The mean ages of Alaska rural nonlocal and nonresident permit holders in the drift fishery have decreased since the mid-2000s. Mean ages in other residence categories in the drift and set gillnet fisheries have consistently increased. The increase in mean age is a result of fewer under-40 fishermen entering the fishery and of the natural aging of existing permit holders. In both fisheries, permit holders under-40 have decreased in number, while permit holders aged 40-to-60 have decreased in the drift fishery and increased in the set gillnet fishery. The largest gains in both fisheries have been in the over-60 age group. There is a clear trend of permit holders increasing in age, but the aging trend is slowing or reversing for all but ARLs in the drift fishery, and slowing for all but ARNs in the set gillnet fishery. Indeed, younger permit holders are entering the fisheries, but they are concentrated in the set gillnet fishery and in the NR and ARN categories of the drift fishery.

The implications of aging local permit holders are that young people are not entering the commercial fisheries as they once did, and that as people retire from fishing, their permits are likely to be sold to young people who do not call Bristol Bay home. The latter implication is evidenced by rural-to-urban youth migration patterns (Donkersloot, 2007; Hamilton & Seyfrit, 1993; Holen, 2014; Seyfrit, Hamilton, Duncan, & Grimes, 1998), and the higher rates of new entry combined with the consistent net loss of permits via transfer from ARL to other residence categories revealed by this and other studies. The declines in the number of young local permit holders are cause for concern because Bristol Bay communities must be sustained by future generations of fishing families living, working, and attending schools in the region. However, our previous research on youth perceptions of commercial fishing as a career path has shown that two factors—family history of participation in commercial fisheries and level of subsistence fishing activity—are significant positive predictors of youth interest in fishing careers (Coleman et al., 2018). These findings indicate that there are opportunities for fostering future generations of local fishermen at individual, community, and regional levels.

4.6. Conclusions

> The reality is that…fishing activities—one of the main, if not the main economic driver, has dried up because of this transition [to limited entry] and nothing has replaced [fishing]. So it's become a lot harder for somebody in Ekwok—Ekwok is one of those villages. Two permits left in the village. Two drifts and one set…And some young guy—it almost gets outside—it's more than 'god I wish I could go fishing, but all the guys around here are not fishing anymore.' It's now become, for a lot of these people…it's almost like this kid is living in Minneapolis, Minnesota. It's not even in his radar anymore. Because there's nobody around there that he knows well enough to want to go fishing with or to ask to go fishing, so it's not part of the culture in Ekwok like it was 30 years ago. And the question is: how does that kid a) get motivated, b) get knowledgeable of and c) find a place to get his feet on the ground to fish? (Drift gillnet fisherman and community leader, 23 September 2015)

Permit loss—despite acute awareness of the problem among locals, academics, and policy-makers—continues in Bristol Bay. Cancellations of nontransferable permits will result in more local permits lost over the coming years. The disaster years were a significant period in which new entry decreased, exvessel prices plummeted, permit loan foreclosures increased, and uncertainty among young residents grew. The effects of this period are still being felt today, as the average age of local permit holders increases every year. The relatively thin-on-the-ground cohort of under-40 fishermen in the past 15 years is a product of permit loss, and lost opportunities for intergenerational transfer of fishing skills, knowledge, and culture. Young people growing up in communities where fishing no longer holds the sociocultural and economic significance that it once did are less likely to be exposed to fishing opportunities or developing the cultural identity that engages one with fishing at a young age. Thus, local access to fisheries is at the root of many interrelated concerns in these communities, including the graying of the fleet, barriers to entry, intergenerational transmission of fishing expertise, fishing livelihood sustainability, and reproduction of fishing cultures and identities.

The conclusions we have drawn are the product of analyzing quantitative trends in permit holdings and permit holder demographics in the context of qualitative perceptions held by local fishery participants of the permit losses that have occurred in Bristol Bay since 1975. Using a mixed-methods approach yielded a more robust understanding of the meaning that permit loss represents for local communities and individuals than could be achieved by either a quantitative or qualitative approach could alone. Basing policy decisions and designing fishery management plans solely on analyses of quantitative data using a single, analytic framework is precisely how problems such as consolidation and inequitable distribution of access rights occur. Researchers and policy-makers—and everyone, really—must have the capacity and willingness to view policy and management problems from more than one perspective. We must strive to recognize that small-scale fishermen, especially those living in fishery-dependent communities, have enduring social and cultural ties to fishing that shape their lived experience in the fishery, and that any rules that are made to regulate fishery access must respect those ties.

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4.8. References

Abrahamson, M. (2011). The Bristol Bay Region: Area relies on fishing, synthesis of modern and traditional. *Alaska Economic Trends, 31*, 8-12.

Acheson, J. M. (1975). Fisheries management and social context: The case of the Maine lobster fishery. *Transactions of the American Fisheries Society, 104*(4), 653-668.

Acheson, J. M. (1981). Anthropology of fishing. *Annual review of Anthropology*, 275-316.

Alaska Commercial Fisheries Entry Commission. (2018a). *Public permit holder database* [Data set]. Retrieved from https://www.cfec.state.ak.us/plook/#permits

Alaska Commercial Fisheries Entry Commission. (2018b). *Permit holder age distribution* [Data set].

Alaska Commercial Fisheries Entry Commission. (2019). *Basic information tables* [Data set]. Retrieved from https://www.cfec.state.ak.us/bit/X_S04T.htm

Alaska Department of Fish and Game. 2018a. Division of Commercial Fisheries press release: 2018 Bristol Bay salmon season summary.

Alaska Department of Fish and Game. 2018b. *Division of Commercial Fisheries Commercial Operator's Annual Report – Production by area* [Data set]. Retrieved from https://www.adfg.alaska.gov/index.cfm?adfg=fishlicense.coar_production_byarea

Alaska Department of Labor and Workforce Development. 2019. *Components of population change: total population place* [Data set]. Retrieved from http://live.laborstats.alaska.gov/pop/estimates/data/TotalPopulationPlace.xls.

Alaska Statutes. (2018). Title16: fish and game, chapter 43: regulation of entry into Alaska commercial fisheries, section 16.43.150: terms and conditions of entry permit; annual renewal.

Apgar-Kurtz, B. (2015). Factors affecting local permit ownership in Bristol Bay. *Marine Policy, 56*, 71-77. http://dx.doi.org/10.1016/j.marpol.2015.02.013

Arnason, R. (2008). Iceland's ITQ system creates new wealth. *The Electronic Journal of Sustainable Development, 1*.

Berger, T. R. (1985). *Village journey: The report of the Alaska Native Review Commission*. New York, NY: Hill & Wang Publishers.

Bernard, H. R. (2011). *Research methods in anthropology: Qualitative and quantitative approaches* (5th ed.). Lanham, MD: AltaMira Press.

Boraas, A., & Knott, C. (2014). *Traditional ecological knowledge and characterization of the Indigenous cultures of the Nushagak and Kvichak watersheds, Alaska (Appendix D)*. Seattle, WA: Retrieved from the US Environmental Protection Agency: https://www.epa.gov/sites/production/files/2015-05/documents/bristol_bay_assessment_final_2014_vol2.pdf.

Breslow, S. J. (2015). Accounting for neoliberalism: "Social drivers" in environmental management. *Marine Policy, 61*, 420-429. https://doi.org/10.1016/j.marpol.2014.11.018

BurnSilver, S., Magdanz, J., Stotts, R., Berman, M., & Kofinas, G. (2016). Are mixed economies persistent or transitional? Evidence using social networks from Arctic Alaska. *American Anthropologist, 118*(1), 121-129. https://doi.org/10.1111/aman.12447

Cannon, J., & Warren, J. (2012). Alaska fishermen: Harvests, earnings and their jobs. *Alaska Economic Trends, 32,* 4-9.

Carothers, C. (2013). A survey of US halibut IFQ holders: Market participation, attitudes, and impacts. *Marine Policy, 38*, 515-522.

Carothers, C. (2015). Fisheries privatization, social transitions, and well-being in Kodiak, Alaska. *Marine Policy, 61*, 313-322. https://doi.org/10.1016/j.marpol.2014.11.019

Carothers, C., & Chambers, C. (2012). Fisheries privatization and the remaking of fishery systems. *Environment and Society: Advances in Research, 3*(1), 39-59.

Carothers, C., Lew, D. K., & Sepez, J. (2010). Fishing rights and small communities: Alaska halibut IFQ transfer patterns. *Ocean & Coastal Management, 53*(9), 518-523. http://dx.doi.org/10.1016/j.ocecoaman.2010.04.014

Chambers, C., & Carothers, C. (2017). Thirty years after privatization: A survey of Icelandic small-boat fishermen. *Marine Policy, 80*, 69-80. https://doi.org/10.1016/j.marpol.2016.02.026

Charles, A. T. (1988). Fishery socioeconomics: A survey. *Land Economics, 64*(3), 276-295. https://doi.org/10.2307/3146251

Charles, A. T. (1991). *Bio-socio-economic dynamics and multidisciplinary models in small-scale fisheries research.* Paper presented at the Scientific Research Facing Artisanal Fishing: Research and Small-scale Fisheries, Montpellier, France.

Charmaz, K. (2006). Constructing grounded theory: A practical guide through qualitative research. London, United Kingdom: *SagePublications Ltd.*

Clark, C. W., & Munro, G. R. (1975). The economics of fishing and modern capital theory: A simplified approach. *Journal of Environmental Economics and Management, 2*(2), 92-106.

Cleveland, W. S., & Devlin, S. J. (1988). Locally weighted regression: An approach to regression analysis by local fitting. *Journal of the American Statistical Association, 83*(403), 596-610. http://dx.doi.org/10.1080/01621459.1988.10478639

Coleman, J., Carothers, C., Donkersloot, R., Ringer, D., Cullenberg, P., & Bateman, A. (2018). Alaska's next generation of potential fishermen: A survey of youth attitudes towards fishing and community in Bristol Bay and the Kodiak Archipelago. *Maritime Studies 18*(1), 47-63. http://dx.doi.org/10.1007/s40152-018-0109-5

Coleman, J. M., Donkersloot, R., Carothers, C., Ringer, D., & Cullenberg, P. (2019). Livelihoods, policy, and change in the fishing communities of Bristol Bay, Alaska. Manuscript submitted for publication.

Costello, C., Gaines, S. D., & Lynham, J. (2008). Can catch shares prevent fisheries collapse? *Science, 321*(5896), 1678-1681.

Coulthard, S. (2011). More than just access to fish: The pros and cons of fisher participation in a customary marine tenure (Padu) system under pressure. *Marine Policy, 35*(3), 405-412. http://dx.doi.org/10.1016/j.marpol.2010.11.006

Coulthard, S. (2012). Can We Be Both Resilient and Well, and What Choices Do People Have? Incorporating Agency into the Resilience Debate from a Fisheries Perspective. *Ecology and Society, 17*(1). https://doi.org/10.5751/ES-04483-170104

Crutchfield, J. A., & Zellner, A. (1973). *The economics of marine resources and conservation policy: The Pacific Halibut case study*. Chicago, IL: University of Chicago.

Cullenberg, P., Carothers, C., Donkersloot, R., Coleman, J., & Ringer, D. (2017). *Turning the tide: How can Alaska address the 'graying of the fleet' and loss of rural fisheries access?* Retrieved from http://fishermen.alaska.edu/turning-the-tide

Donkersloot, R. (2005). *Ecological crisis, social change and the life-paths of young Alaskans: An analysis of the impacts of shifting patterns in human-environment interaction in the fisheries-dependent region of Bristol Bay, Alaska* (master's thesis). Missoula, MT: University of Montana.

Donkersloot, R. (2007). *Youth emigration and reasons to stay: Linking demographic and ecological change in Bristol Bay, Alaska.* Paper presented at Alaska's fishing communities: Harvesting the future, Anchorage, AK.

Donkersloot, R., & Carothers, C. (2016). The graying of the Alaskan fishing fleet. *Environment: Science and Policy for Sustainable Development, 58*(3), 30-42.

Donkersloot, R., Carothers, C., Coleman, J., & Ringer, D. (2019). Kin, Community and Diverse Rural Economies: Rethinking Resource Governance for Alaska Rural Fisheries. Manuscript submitted for publication.

Eythórsson, E. (2000). A decade of ITQ-management in Icelandic fisheries: Consolidation without consensus. *Marine Policy, 24*(6), 483-492.

Fall, J. A., Holen, D., Krieg, T. M., La Vine, R., Stickman, K., Ravenmoon, M., . . . Stariwat, J. (2010). *The Kvichak watershed subsistence salmon fishery: An ethnographic study*. Alaska Department of Fish and Game, Division of Subsistence: Anchorage, AK.

Foley, P., Mather, C., & Neis, B. (2015). Governing enclosure for coastal communities: Social embeddedness in a Canadian shrimp fishery. *Marine Policy, 61*, 390-400. http://dx.doi.org/10.1016/j.marpol.2014.11.009

Fraser, G. A. (1979). Limited entry: Experience of the British Columbia salmon fishery. *Journal of the Fisheries Board of Canada, 36*(7), 754-763.

Fried, N. (2019). Alaska's Personal Income: The makeup of what we take in and how Alaska compares. *Alaska Economic Trends, 39,* 4-8.

Fulton, E. A., Smith, A. D., Smith, D. C., & van Putten, I. E. (2011). Human behaviour: The key source of uncertainty in fisheries management. *Fish and Fisheries, 12*(1), 2-17.

Gho, M. (2015). *CFEC permit holdings and estimates of gross earnings in thed Bristol Bay commercial salmon fisheries, 1975-2014* (15-4N). Alaska Commercial Fisheries Entry Commission: Juneau, AK.

Gho, M., & Farrington, C. (2018). *Changes in the distribution of Alaska's commercial fisheries entry permits, 1975-2017* (18-02N). Alaska Commercial Fisheries Entry Commission: Juneau, AK.

Gilbertsen, N. (2004, December). Residency and the Alaska fisheries. *Alaska Economic Trends*, *24*(12): 4-14. Retrieved from http://laborstats.alaska.gov/trends/dec04art1.pdf

Glaser, B. G. (1978). *Theoretical sensitivity: Advances in the methodology of grounded theory*. Mill Valley, CA: Sociology Press.

Gordon, H. S. (1954). The economic theory of a common-property resource: The fishery. *Journal of Political Economy, 62*(2), 124-142. http://dx.doi.org/10.2307/1825571

Greene, J. C. (2007). *Mixed methods in social inquiry* (Vol. 9). San Francisco, CA: Jossey-Bass.

Hamilton, L. C., & Seyfrit, C. L. (1993). Town-village contrasts in Alaskan youth aspirations. *Arctic, 46*(3), 255-263.

Harling Stalker, L., & Phyne, J. G. (2014). The social impact of out-migration: A case study from rural and small town Nova Scotia, Canada. *Journal of Rural & Community Development, 9*(3).

Haynie, A. C. (2014). Changing usage and value in the Western Alaska Community Development Quota (CDQ) program. *Fisheries Science, 80*(2), 181-191. https://doi.org/10.1007/s12562-014-0723-0

Hébert, K. (2015). Enduring capitalism: Instability, precariousness, and cycles of change in an Alaskan salmon fishery. *American Anthropologist, 117*(1), 32-46.

Hirschfield, M. (1991). The Alaska Native Claims Settlement Act: Tribal sovereignty and the corporate form. *Yale Law Journal, 101*, 1331.

Holen, D. (2014). Fishing for community and culture: The value of fisheries in rural Alaska. *Polar Record, 50*(04), 403-413.

Holen, D. (2017). *Subsistence and commercial fisheries through the lenses of culture and economy in three coastal Alaskan communities* (PhD dissertation). University of Alaska Fairbanks, Fairbanks, Alaska.

Jentoft, S. (1989). Fisheries co-management: Delegating government responsibility to fishermen's organizations. *Marine Policy, 13*(2), 137-154. https://doi.org/10.1016/0308-597X(89)90004-3

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher, 33*(7), 14-26.

Kamali, N. (1984). *Alaskan Natives and limited entry fisheries of Alaska: A study of changes in the distribution of permit ownership amongst Alaskan Natives, 1975–1983* (Commercial Fisheries Entry Commission Report Number 84–8). Juneau, AK.

Karpoff, J. M. (1984). Low-interest loans and the markets for limited entry permits in the Alaska salmon fisheries. *Land Economics, 60*(1), 69-80. https://doi.org/10.2307/3146094

Knapp, G. (2011). Local permit ownership in Alaska salmon fisheries. *Marine Policy, 35*(5), 658-666.

Knapp, G., & Lowe, M. (2007). *Economic and social impacts of BSAI crab rationalization on the communities of King Cove, Akutan and False Pass*. Report prepared for the Aleutians East Borough and the City of King Cove. Anchorage, AK.

Koslow, J. A. (1982). Limited entry policy and the Bristol Bay, Alaska salmon fishermen. *Canadian Journal of Fisheries and Aquatic Sciences, 39*(3), 415-425.

Langdon, S. J. (1980). *Transfer patterns in Alaskan limited entry fisheries: Final report for the Limited Entry Study Group of the Alaska State Legislature*.

Lavoie, A., & Himes-Cornell, A. (2019). Social networks of Alaska fishing communities. *Coastal Management*, 1-22.

Lewicka, M. (2011). Place attachment: How far have we come in the last 40 years? *Journal of Environmental Psychology, 31*(3), 207-230. https://doi.org/10.1016/j.jenvp.2010.10.001

Loring, P. A., & Gerlach, S. C. (2009). Food, culture, and human health in Alaska: an integrative health approach to food security. *Environmental Science & Policy, 12*(4), 466-478. doi:https://doi.org/10.1016/j.envsci.2008.10.006

Mauser, W., Klepper, G., Rice, M., Schmalzbauer, B. S., Hackmann, H., Leemans, R., & Moore, H. (2013). Transdisciplinary global change research: The co-creation of knowledge for sustainability. *Current Opinion in Environmental Sustainability, 5*(3), 420-431. https://doi.org/10.1016/j.cosust.2013.07.001

McCarthy, J., & Prudham, S. (2004). Neoliberal nature and the nature of neoliberalism. *Geoforum, 35*(3), 275-283. DOI:10.1016/j.geoforum.2003.07.003

McDowell Group. (2017). *The economic value of Alaska's seafood industry*. Retrieved from https://www.mcdowellgroup.net/wp-content/uploads/2017/10/ak-seadfood-impacts-sep2017-final-digital-copy.pdf

Morehouse, T. A., & Hession, J. (1972). Politics and management: The problem of limited entry. In A. R. Tussing, T. A. Morehouse, & J. D. Babb (Eds.), *Alaska fisheries policy* (pp. 279-332). Fairbanks, AK: Institute of Social, Economic, and Government Research, University of Alaska.

National Oceanic and Atmospheric Administration. (2017). Total commercial fishery landings at major US ports summarized by year and ranked by dollar value. NOAA National Marine Fisheries Service Commercial Fisheries Statistics. Retrieved from https://www.st.nmfs.noaa.gov/pls/webpls/MF_LPORT_YEARD.RESULTS

Northern Economics. (2009). *The importance of the Bristol Bay salmon fisheries to the region and its residents* (Report prepared for the Bristol Bay Economic Development Corporation). Anchorage, AK.

Oakley, K. (1989). *The permit drain in the 1980s: A study of recent transfers of entry permits for Alaska's limited fisheries* (House Research Agency Report 89-C). Juneau, AK: Alaska State Legislature.

Olson, J. (2011). Understanding and contextualizing social impacts from the privatization of fisheries: An overview. *Ocean & Coastal Management, 54*(5), 353-363.

Opaluch, J. J., & Bockstael, N. E. (1984). Behavioral modeling and fisheries management. *Marine Resource Economics*, 105-115.

Petterson, J. S. (1983). Policy and culture: the Bristol Bay case. *Coastal Zone Management Journal, 10*(4), 313-330. doi: 10.1080/08920758309361926

Polanyi, K. (1957). *The great transformation: The social and economic origins of our time*. Boston, MA: Beacon.

Poppel, B. (2006). Interdependency of subsistence and market economies in the Arctic. In S. Glomsrød & J. Aslaksen (Eds.), *The economy of the North* (pp. 65-80). Oslo, Norway: Statistics Norway.

Ricker, W. E. (1954). Stock and recruitment. *Journal of the Fisheries Board of Canada, 11*(5), 559-623.

Riley v. Simon. (1990). 790 P.2d 1339 (Alaska 1990)

Ringer, D., Carothers, C., Donkersloot, R., Coleman, J., & Cullenberg, P. (2018). For generations to come? The privatization paradigm and shifting social baselines in Kodiak, Alaska's commercial fisheries. *Marine Policy, 98*(2018), 97-103.

Rogers, G. W. (1979). Alaska's limited entry program: Another view. *Journal of the Fisheries Board of Canada, 36*(7), 783-788.

Ruby, A., and Heyano, R. (2016). Efforts to regain permits: successes and challenges in Bristol Bay. In P. Cullenberg (Ed.), *Fisheries Access for Alaska—Charting the Future: Workshop Proceedings* (Vol. AK-SG-16-02, pp. 73-80). Fairbanks, Alaska: Alaska Sea Grant, University of Alaska Fairbanks.

Salomone, P., Elison, T., Sands, T., Head, J., & Lemons, T. (2019). *2018 Bristol Bay area management report* (Fishery Management Report No. 19-12). Retrieved from https://www.adfg.alaska.gov/FedAidPDFs/FMR19-12.pdf

Seyfrit, C. L., Hamilton, L. C., Duncan, C. M., & Grimes, J. (1998). Ethnic identity and aspirations among rural Alaska youth. *Sociological Perspectives, 41*(2), 343-365.

Smith, A., Sainsbury, K., & Stevens, R. (1999). Implementing effective fisheries-management systems: Management strategy evaluation and the Australian partnership approach. *ICES Journal of Marine Science, 56*(6), 967-979.

Soliman, A. (2014). Individual transferable quotas in world fisheries: Addressing legal and rights-based issues. *Ocean & Coastal Management, 87*, 102-113. https://doi.org/10.1016/j.ocecoaman.2013.09.012

Stewart, J., & Callagher, P. (2011). Quota concentration in the New Zealand fishery: Annual catch entitlement and the small fisher. *Marine Policy, 35*(5), 631-646. http://dx.doi.org/10.1016/j.marpol.2011.02.003

Stockdale, A. (2004). Rural out-migration: Community consequences and individual migrant experiences. *Sociologia Ruralis, 44*(2), 167-194. http://dx.doi.org/10.1111/j.1467-9523.2004.00269.x

Strauss, A. L., & Corbin, J. M. (1990). *Basics of qualitative research* (Vol. 15): Newbury Park, CA: Sage Publishers.

Tussing, A. R., Morehouse, T. A., & Babb, J. D. (1972). *Alaska fisheries policy*. Fairbanks, AK: Institute of Social, Economic and Government Research, University of Alaska Fairbanks.

Walters, C. J., & Hilborn, R. (1976). Adaptive control of fishing systems. *Journal of the Fisheries Board of Canada, 33*(1), 145-159.

Watts, M. (1994). Development II: The privatization of everything? *Progress in Human Geography, 18*(3), 371-384. http://dx.doi.org/10.1177/030913259401800307

Weeratunge, N., Bene, C., Siriwardane, R., Charles, A., Johnson, D., Allison, E. H., . . . Badjeck, M. C. (2014). Small-scale fisheries through the wellbeing lens. *Fish and Fisheries, 15*(2), 255-279.

Chapter 5. Conclusions

5.1. Fishing rights, cultural reproduction, and youth exposure

More fishing rights have left Bristol Bay communities by transfer to nonlocals than any other fishery in Alaska. The movement of fishing rights is a design feature of privatized fishery access regimes (e.g., limited entry), but the inequitable distribution of those rights among generations, ethnicities, and geographies is highly problematic. Fisheries around the globe bear the same scars from privatization of fishery access, including Iceland, Canada, New Zealand, and other Alaskan fisheries. The problem continues to be pervasive, and the effects are complex and far-reaching.

In Bristol Bay, the loss of rights early in the limited entry period of the fishery was and still is deeply troubling to local communities. Language barriers, inappropriate qualification criteria, an overly burdensome application process, and poor communication with applicants meant that rural and Indigenous fishermen were at a significant disadvantage in the initial allocation of rights (Petterson 1983). Many locally held rights were sold in the 1970s and 1980s; the ethnographic data suggest that people sold permits without understanding fully the implication of doing so, or that those rights would most likely be gone forever. Proximately, rights were sold in times of acute financial need (i.e., to purchase food, gasoline, heating fuel, etc.), but ultimately this loss of rights occurred because the local worldview did not recognize access to salmon for food and sharing (social and cultural purposes) or income generation as a commodified piece of private property. This arrangement was nonsensical and abhorrent to Yupiaq, Dena'ina, and Sugpiaq peoples whose relationships to salmon were informed by their Indigenous worldviews (Kawagley 2006).

The results of this immense loss, which continues today, are that fewer opportunities exist for youth to engage with the practice of fishing beyond subsistence. However, there is a strong linkage between subsistence and commercial fishing which indicates that youth that engage in subsistence fishing are more likely to be interested in commercial fishing in the future (Coleman et al. 2018). Others have described the mutually beneficial relationships between subsistence and commercial fishing along dimensions of sharing and reciprocity, social status, income generation, and culture (BurnSilver et al. 2016; Fall et al. 2010; Holen 2017); we now also know that subsistence fishing is a conduit for passage of fishing knowledge, skills, and practices to young people. This is not to say that the loss of fishing rights is a minor threat to the ability of today's youth to pursue a livelihood in the Bristol Bay region in the future. Commercial fishing and subsistence fishing are both critically important; one does not replace the other.

Youth exposure to different choices and potential lifestyles and livelihoods is a much different proposition now than it was a generation ago (Tieken 2016). The combination of fewer local fishing families, numerous scholarships and training programs available to local youth, and instantaneous access to the world beyond Bristol Bay via the internet and social media means that a commercial fishing career

is one of thousands of options youth have today. Nearly 89% of youth surveyed in this study planned on going to college; studies of youth outmigration in fishing- and farming-dependent regions have identified "brain drain"—youth leaving their hometowns for college but not returning—as a challenge to social and economic sustainability in small rural communities. Today, college is an expected pathway to a career and financial stability (Lowe et al. 2012), although the unspoken outcome of these expectations is for that for many students, college and career are incompatible with life in rural Alaska (Hamilton and Seyfrit 1993; Petrin et al. 2014).

Why would a young person living in Bristol Bay, Alaska, become a fisherman? Individual motivations complex and nuanced, but there are commonalities among the suite of factors that drive a person's decision to enter fishing or not. I have shown, as have other empirical studies on decision making in the context of fishing, that entry into fisheries is positively related to permit values, where higher values approximate higher expected economic returns (Opaluch and Bockstael 1984; Grafton 1996; Béné and Tewfik 2001). In other words, a person enters fishing if it is expected to be financially viable. In addition, this research has shown that young people enter fisheries where there exists a strong culture of fishing that supports cohesion among community members and a shared identity as commercial fishing people. A young person would choose commercial fishing over all other options because they feel a strong sense of place in Bristol Bay, that fishing is a part of their identity, and that they can financially support their livelihood and family by fishing. Retention and repatriation of fishing rights is a critical activity that is a necessary step to sustaining the social and cultural ties to fishing that have existed in the region for thousands of years. If you build it—inalienable local access to fisheries—they may come or they may not, but if you destroy it, they will most certainly leave.

At the moment, given the current context of fisheries management, the threats to fishing livelihoods in Bristol Bay outnumber the supports. The supports, however, are essential to understanding the most effective ways to combat the threats. Supports include social and kin networks that are the basis of sharing of food, knowledge, materials, and traditions that contribute to the practical and symbolic aspects of commercial fishing. They also include the shared culture and identities as fishing people/places that are passed from older to younger generations. Accordingly, I attribute the threats to the failure of our fisheries researchers and policymakers to 1) step outside of the neoliberal worldview that is so pervasive in the governance structures of the developed world; 2) include the voices and worldviews of politically disadvantaged groups in regulatory processes and research teams; and 3) cede the power they hold in the design and implementation of research and policy to the people whose livelihoods will be most affected.

5.2. Moving forward

In practical terms, these failures are not irreversible. Assuming the political will exists to make change that will result in more robust understandings of fishery systems and more equitable outcomes of

fisheries policy, small changes can have significant impacts. In academia, changes include hiring faculty that have broad, multidisciplinary backgrounds; putting local communities (where applicable) in charge of research goals; training fisheries researchers and graduate students to use multiple tools and disciplinary frameworks to examine problems or research questions at larger scales; including critique, social justice, and equity as cross-cutting dimensions of all topical coursework; and hiring and recruiting faculty and students that have diverse experiences and worldviews (in addition to diversity in gender, race, ethnicity, nationality, physical ability, and sexual orientation). Similar changes may be instituted among the major decision-making bodies in fisheries—for example, the North Pacific Fishery Management Council and the Alaska Board of Fisheries. Changes include development of a multidisciplinary committee (akin to the Science and Statistical Committee) to analyze and interpret research on the impacts of policy across social, economic, biological, and ethical dimensions, and appointing members to the Council and Advisory Panels based not only on their credentials or interest-group affiliations, but according to the above-mentioned diversity criteria.

It is not the intention of this work to determine what the future of Bristol Bay will look like. That power lies with the people of the region. They are, have always been, and will always be fishing people.

5.3. References

Béné, C. and A. Tewfik. 2001. Fishing effort allocation and fishermen's decision making process in a multi-species small-scale fishery: analysis of the conch and lobster fishery in Turks and Caicos Islands. *Human Ecology* 29(2): 157-186.

BurnSilver, S., J. Magdanz, R. Stotts, M. Berman and G. Kofinas. 2016. Are mixed economies persistent or transitional? Evidence using social networks from arctic Alaska. *American Anthropologist* 118(1): 121-129.

Coleman, J., C. Carothers, R. Donkersloot, D. Ringer, P. Cullenberg and A. Bateman. 2018. Alaska's next generation of potential fishermen: a survey of youth attitudes towards fishing and community in Bristol Bay and the Kodiak Archipelago. *Maritime Studies* 18(1): 47-63.

Fall, J.A., D. Holen, T.M. Krieg, R. La Vine, K. Stickman, M. Ravenmoon, J. Hay and J. Stariwat, 2010. The Kvichak watershed subsistence salmon fishery: an ethnographic study. Alaska Department of Fish and Game, Anchorage, Alaska.

Grafton, R.Q. 1996. Individual transferable quotas: theory and practice. *Reviews in Fish Biology and Fisheries* 6(1): 5-20.

Hamilton, L.C. and C.L. Seyfrit. 1993. Town-village contrasts in Alaskan youth aspirations. *Arctic* 46(3): 255-263.

Holen, D. 2017. *Subsistence and commercial fisheries through the lenses of culture and economy in three coastal Alaskan communities.* PhD dissertation. Fairbanks: University of Alaska Fairbanks.

Kawagley, A.O. 2006. *A Yupiaq worldview: a pathway to ecology and spirit.* Long Grove, IL: Waveland Press, Inc.

Lowe, M.E., M. Wilson, R. Miller and K. Sanders, 2012. Alaska coastal community youth and the future. Report prepared for the Alaska Sea Grant College Program. Institute of Social and Economic Research, Anchorage, Alaska.

Opaluch, J.J. and N.E. Bockstael. 1984. Behavioral modeling and fisheries management. *Marine Resource Economics*: 105-115.

Petrin, R.A., K.A. Schafft and J.L. Meece. 2014. Educational sorting and residential aspirations among rural high school students. *American Educational Research Journal* 51(2): 294-326.

Petterson, J.S. 1983. Policy and culture: the Bristol Bay case. *Coastal Zone Management Journal,* 10(4): 313-330.

Tieken, M.C. 2016. College talk and the rural economy: shaping the educational aspirations of rural, first-generation students. *Peabody Journal of Education* 91(2): 203-223.

Appendices

Appendix 1. Institutional Research Board approval

UNIVERSITY OF ALASKA FAIRBANKS

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Institutional Review Board

909 N Koyukuk Dr. Suite 212, P.O. Box 757270, Fairbanks, Alaska 99775-7270

October 21, 2014

To:	Courtney Carothers, PhD Principal Investigator
From:	University of Alaska Fairbanks IRB
Re:	[555479-5] Graying of the Fleet in Alaska's Fisheries: Defining the Problem and Assessing Alternatives

Thank you for submitting the Amendment/Modification referenced below. The submission was handled by Expedited Review under the requirements of 45 CFR 46.110, which identifies the categories of research eligible for expedited review.

Title:	Graying of the Fleet in Alaska's Fisheries: Defining the Problem and Assessing Alternatives
Received:	September 24, 2014
Expedited Category:	*6 and 7*
Action:	APPROVED
Effective Date:	October 21, 2014
Expiration Date:	May 22, 2015

This action is included on the November 5, 2014 IRB Agenda.

No changes may be made to this project without the prior review and approval of the IRB. This includes, but is not limited to, changes in research scope, research tools, consent documents, personnel, or record storage location.

Appendix 2. Informed consent form

Informed Consent Form
Graying of the Fleet in Alaska's Fisheries
IRB Project Title 555479-3 Date Approved 7/7/14

Description of the Study:
You are being asked to take part in a research study about the commercial fisheries of Alaska.

The goal of the study is to learn more about young people and fishing. We want to know more about obstacles young people face. We want to understand how young fishermen develop successful fishing careers. We hope to gather new ideas for policies that may help young people enter fishing. You are being asked to take part in this study because you were identified as an expert in these topics.

We encourage you to ask questions and take the opportunity to discuss the study before making a decision on whether or not to participate.

If you decide to take part, we would set up a 30 to 60 minute interview with you. We would like to audiotape our interview(s) with you. We will use these tapes to help us recall the information that you provided in the interview. The audio files may be interesting for you and your family. We will offer you a copy of your interview. With your permission, we could also add these files to the Oral History Collection at the University of Alaska Fairbanks (UAF) Library. We would contact you and get your permission prior to cataloguing your interview tapes.

Risks and Benefits of Being in the Study:
We do not expect any risks for you if you take part in this study. You may feel uncomfortable being interviewed and/or audiotaped. We will try our best to conduct the interviews in a place and in a format that is comfortable for you.

You may not receive any benefits from taking part in this study. The knowledge that we collect in this study might help us understand more about the graying of the fleet in Alaska. This information may help fishery managers and community leaders plan for future decisions.

Compensation:
We will compensate you for your time at $25/hour.

Confidentiality:
The information we collect will be stored in a locked office. Only the research team, Courtney Carothers, Rachel Donkersloot, Paula Cullenberg, Jesse Coleman, and Danielle Ringer, will have access to any confidential information that we collect in our interviews, unless you would like to archive your interview for future use. If you are comfortable, we would like to audio-tape the interview to help us in note-taking. The files will be kept in password-protected files, in a locked office at the University of Alaska Fairbanks and the Alaska Marine Conservation Council. If you would like your interview available for the public, we can provide a copy of the tape to the Oral History Collection at UAF for future generations. We will also supply you with a copy of our interview if you would like. Any information we collect will not be linked with your name without written permission. For example, if we would like to quote you, we would contact you again and ask for your permission to so.

Voluntary Nature of the Study:
Your decision to take part in the study is completely voluntary. You are free to choose not to take part in the study or to stop taking part at any time.

Contacts and Questions:
If you have questions now, feel free to ask us. If you have questions later, you may contact:

Courtney Carothers
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The UAF Institutional Review Board (IRB) is a group that reviews university research projects involving people. This review is done to protect the people participating in the research. The committee wants to help make the project the best it can be for the participants' benefit and the researchers'. If you have questions or concerns about your rights as a research subject, please contact the Research Coordinator in the Office of Research Integrity at 474-7800 (Fairbanks area) or 1-866-876-7800 (outside the Fairbanks area) or uaf-irb@alaska.edu.

Statement of Consent:
I understand the procedures described above. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been provided a copy of this form.

___ Yes, you may use my name to acknowledge my participation in this study
___ No, I wish my identity to remain private

___ Yes, I would like a personal copy of my interview
___ No, I do not want a personal copy of my interview

___ Yes, you may share my interview with the Oral History Collection at UAF
___ No, please do not share my interview with the Oral History Collection at UAF

Would you like to supply your mailing and/or email address to receive updates about the project?
These will be kept confidential and used only for mailing project-related correspondence.

Mailing Address: Email:

_____ _____

_____
Signature of Participant & Date

_____
Signature of Person Obtaining Consent & Date

Appendix 3. Analytical memos for selected codes.

1. Financial

1.1. Financial Barriers to Entry

By far and away the most significant and frequent barrier to entry that emerged from our interview data is that of the capital required to invest in a fishing operation. The initial costs of a down payment for a permit, a vessel, and gear are so formidable that saving enough money is nearly impossible, from the perspectives of both veteran and young fishermen. People tended to verbally scribble out back-of-the-napkin calculations of how much a fishing operation costs today:

> "For…drift fishing, it's just the cost of getting into it. It's so astronomical. The permit price is one sixty-five. If you want a really nice boat, you're looking at a half a million for something really, really nice…You could get into it with some than less than desirable boat for 80 thousand dollars, but then you're limiting yourself. So realistically if you want to get into the fishery, you're going to spend $200,000 on a boat. And then you're going to have to spend another $50,000 on gear. So you're looking at $400,000 to get into the fishery, realistically. That's a lot of money."
> —Naknek set net fisherman, 26 February 2015

Most participants agreed that the financial barriers to entry for young fishermen are a problem. However, there were (and there always are) a few who contested that notion, and offered the existence of the Bristol Bay Economic Development Corporation programs as contradictory to the financial barriers perceived by most Bay residents. It's possible that these few are contrarians, or else they genuinely believe that BBEDC permit loan programs erase the fiscal challenges of entering the commercial fishing industry. Regardless, the cost of rights, vessels, and gear is higher now with a lower rate of return (see below) than it has been in generations past, and our qualitative data support that conclusion.

1.2. Barriers to Staying in the Industry

Not only are the up-front costs staggering, but given the current ex-vessel prices[1], the rate of return and thus the financial viability of a commercial fishing operation is more tenuous and overall more difficult to sustain today. Once the initial investments have been made, a permit holder must consider monthly principal and interest payments on the permit and vessel loans (if they have them), alongside any other debts outside of fishing that they may have. Yearly costs, including vessel maintenance, insurance, taxes, fuel, and crew costs (including food) all accumulate before fishing begins and pose a threat to the viability of a fishing operation on an interannual basis. Exacerbating these risks are all the reasons why a fisherman's income might end up being less than anticipated, including low productivity (mechanical challenges, not finding fish), being put "on limit" (see memo: Processors), and low fish prices or returns.

> "Somebody that's just getting into the fisheries is looking to pay off that permit and that boat. So, not only is it a huge barrier, those payments to get into the fishery, but once you're into the fishery, as long as you have those payments hanging over your head, that cuts into your profits at the end of the year, and it really makes you kind of think about…what you can and can't do."
> —Dillingham drift fisherman, 3 October 2014

[1] See Section 7 Markets & Prices

1.3. Attitudes & Knowledge About Money

1.3.1. Saving Money

In the early days of the independent fisherman, buying into the fishery was as straightforward as purchasing a just-seaworthy boat and paying or splitting the cost of a $75 gear license. After limited entry, those who were not issued permits were suddenly at a significant disadvantage in accessing the fishery relative to those who were and to the way things had been just a few years before. Under limited entry, the number of crewmembers transitioning to the captain's role is likely to have decreased (assuming that the number of participants that would participate had the fisheries remained open access would have increased relative to the number of permits allocated at the onset of limited entry). Some captains and several crew members described the bleak prospects of working one's way up in the fishery as a deckhand, and the relative impracticality and impossibility of saving money as a deckhand in order to buy into the fishery. Though deckhands have successfully done so, working for a decade and transitioning to an ownership role doesn't seem to be a straightforward or easy task.

1.3.2. Aversion to Debt

There are two perspectives emerging from the data that suggest change in how people perceive taking on debt in relation to investing in a commercial fishing operation. On one hand, there are a group of people that were perhaps raised by Depression-era parents that instilled in them an ethic of saving money and not living beyond one's means. These are the captains that perhaps entered the commercial fisheries before or shortly after Limited Entry was put into place, when it was feasible to pay cash or take on small debts to start fishing. On the other hand, it has become commonplace in our shared culture as Americans to simultaneously hold a mortgage, a car loan, student loans, and credit card debt. The level of comfort that one has in relation to carrying debt certainly affects their decision to invest a large sum of the bank's money in a commercial fishing operation, but there doesn't seem to be a broad trend encompassing all fishermen that suggests which direction attitudes are moving.

Zooming in a bit to state and regional trends in taking on debt, several fishermen commented on the mixed results of the State of Alaska commercial fishing loan program. Certainly, some fishermen were given access to financial resources that they otherwise wouldn't have had, but at the same time, the early days of the program were regarded as something much more problematic. Because going into decades-long debt to purchase fishing rights and vessels was a relatively new occurrence—thanks to the Limited Entry system and to the waning interest of the processing sector in playing the bank for its fishermen—many local residents ended up foreclosing on their loans, which sometimes has disastrous consequences for their livelihoods.

> "The worst thing that ever happened was the same program I signed up for, was a commercial—State of Alaska commercial fishing loan program, they bought my boat, secured my limited entry permit and if I failed that—if I failed that loan they would take my permit and being able to operate and continue to support my family. I would say over half the permits exiting Bristol Bay, that's how the State of Alaska lost—Bristol Bay area has lost the permits in the region. Seen multiple boat loans default, multiple permits get seized and taken away, and they're left with a boat they cannot fish."
> —Dillingham drift fisherman, 23 September 2015

1.3.3. Good, Bad, or No Credit

Another barrier to entry for many young and new fishermen is their credit history, or lack thereof. By nature of their age and relatively limited participation in banking and lending processes, a young person does not have the

credit history that signifies to a lender that they present an acceptable, potentially profitable risk. Alternatively, a new fisherman may have a poor credit score that prevents them altogether from securing loans to buy into the fishery. The State of Alaska Commercial Fishing Loan Fund was setup to address the challenges inherent to securing financing specifically for self-employed fishermen, whose incomes fluctuate from year to year, and whose only collateral is the fishing permit itself (i.e., other institutions cannot accept the permit as collateral, since it is technically a "use privilege" that is wholly owned by the State of Alaska). Still, this and other institutions specifically designed to lend to fishermen (e.g., the Commercial Fishing and Agriculture Bank) report an ongoing lack of qualified loan candidates, stemming from lack of or poor credit history, among other things.

1.3.4. Financial Literacy

The interview data are rife with bemoanings of the complicated and frustrating nature of navigating financial (i.e., banking and lending) processes[2]. Buying into the fishery is the first experience many fishermen have of applying for loans and paying federal income taxes, and the lack of preparation and education can result in slowing or halting of the lending process. For example, a deckhand from Togiak attempted to apply for the BBEDC Permit Loan Program, but didn't have—nor could he secure—the required three years' worth of tax return paperwork, so he had to continue fishing and properly filing his taxes in order to become eligible for the program. Not only can financial illiteracy prevent one from entering commercial fishing, it also poses a threat to the security of that permit over the long run. Financial mismanagement of a fishing business, such as missing loan payments or failing to pay taxes have often resulted in seizures by the IRS or repossession of fishing permits by the State of Alaska (depending on the person's situation).

[In response to the question: How did you learn your business management, financial side of things?]

> "I still haven't learned it – I'm still struggling. I'm still making payments to the IRS because I didn't save all the money I needed to. It's a struggle that I go through every single year. Finally I think turning 30 helped me pull my head out a little bit and realize that I need to be more responsible. So when I come back from Alaska this summer, I'm going to set aside a third of my money in a bank account that I don't have access to unless I speak with a (0:44:30.5). I'm gonna hide money from myself. I think that's something that's really hard when you get a lump sum. You have that money sitting in your bank account and it's like, 'Hey, I have this money'. But wrapping your head around the fact that no, you don't actually have a third of that – a third of that is going away, you just haven't given it to them yet. That's one of my biggest struggle is managing money for tax time."
> —Naknek set net fisherman, 21 April 2015

1.4. Taxes and Non-Fishing Financial Obligations

As mentioned above, knowledge and confidence navigating financial systems, including the US Tax Code, are critical to starting and maintaining a commercial fishing business. Prior to the Carle decision in 1996, the Internal Revenue Service (IRS) regularly seized State of Alaska limited entry permits due to non-payment of backtaxes. The Carle case abolished this practice and established that a limited entry permit did not constitute property that could be owned by an individual, but rather a use privilege that was held by the fisherman for an indeterminate length of time. However, several interviewees had experience with or had family members or fishing partners that had lost permits or were at one point in jeopardy of losing permits due to debts to the IRS. In addition,

[2] See Section 10 Knowledge and Skills

other debts resulting from non-payment of court-ordered child support and criminal fines or legal fees constitute challenges to meeting the financial obligations of running a successful fishing business, or from investing in one in the first place.

1.5. Risk and Uncertainty

Revenues from fishing are unpredictable from one year to the next, making it extremely difficult to plan for the long-term viability of a fishing business. Being conservative, setting aside money for boat maintenance, health and business insurance, and retirement, and diversifying income are all prudent yet challenging tasks for most local permit holders. The uncertainty in fishing incomes has led to a shift in how outside employment (i.e., non-fishing employment) is viewed and incorporated into commercial fishing careers[3]. Veteran fishermen observed frequently that early in their fishing experience, it was possible and commonplace for a fisherman to earn sufficient income to live on for the rest of the year, and that that is no longer true. The fluctuation of fishing incomes, exvessel prices, and costs from year to year is a challenging aspect of commercial fishing that new entrants may have difficulty getting a handle on, which may put them at risk of "crash[ing] and burn[ing] in [the] first year" (Dillingham drift fisherman, 1 October 2014).

In a slightly interesting twist, I interviewed the mother of the captain quoted above (a longtime fisherman), and when the issue of uncertainty in fishing wages came up, she illustrated her point using an example involving her daughter as a high-school student. The daughter crewed for many years with her parents, and one year she was offered a paid internship from BBEDC for the summer. Daughter asked her parents if they could guarantee her a wage at least as much as the internship would offer, and the parents—who were very pragmatic and fiscally responsible captains—said, "no, you work on a share like any other crewman. We make money, you make money, we don't make money, you don't make money. I can't guarantee you anything" (Dillingham drift fisherman, 5 October 2014).

1.6. Sources of Financial Support

Despite the financial challenges experienced by fishermen in buying into a fishery, there are numerous mechanisms by which these challenges may be overcome. The most oft-cited example of these mechanisms is the Permit Loan Program offered by the regional Community Development Quota (CDQ) entity, the Bristol Bay Economic Development Corporation[4], which guarantees loans originating from other institutions and provides generous (up to 95%) of the down payment required to purchase a limited entry permit. Seller-financed transfers are also commonplace; these may or may not include a type of sweat-equity arrangement in which the buyer works for a discounted rate of pay for a period of time prior to the transfer in order to build equity as an owner of the fishing permit. In addition, with or without sweat-equity arrangements, the buyer may purchase or barter for a permit, on the condition that a percentage of their gross revenue will go to the seller for a pre-determined or indeterminate amount of time. An example of this might be a grandson buys (or inherits) his grandmother's permit, but gives her 10% of his fishing income every year as a pseudo "pension" or retirement plan. Finally, it is common—as it is outside of

[3] See Section 4 Outside Employment

[4] See Section 16 Community Quota Development Program

commercial fishing—for people to provide financial support to young family members to invest in a commercial fishing operation. Kin-based lending or gifting of a down payment or the permit itself seems to be a relatively common practice in Bristol Bay, and a pathway that has led young and new fishermen successfully into commercial fishing careers.

The following is a lightly edited excerpt of an interview with a young fishing captain that details his experiences trying to buy into the fishery.

> Interviewer: And do you have a permit now?
>
> Fisherman: I bought a boat in 2005, and I leased a permit for two seasons, and then I was not doing really well, [laughs] but the first year I had the boat it was a financial disaster. I put myself in crazy, crazy debt.
>
> Interviewer: Really? What happened? Like how did—
>
> Fisherman: Well, I fished for three years with my uncle George—my uncle Fritz, family nickname—we called him Uncle Fritz—and he convinced me to buy a boat and I had saved money for three years, every cent I had plus I borrowed some money to buy the boat and lease the permit and my plan was to—I had fished with him for three seasons in Egegik and my plan was to buy the boat and follow him to Egegik—kind of shadow fish behind him because I didn't know what the hell I was doing. And the day I launched the boat, getting ready to go to Egegik, he went into the hospital with throat cancer and he never came out. So that first season I kind of spent at the hospital by his bedside. And then I re-named the boat Uncle Fritz, which is my boat now. And my dad had fished for years and he had sold out of it when the price was down—he couldn't afford to do it anymore. And he has another small business here—land surveying…He didn't need to fish. But then I bought the boat and I was in dire straits and he said 'oh, well I miss fishing' so he bought a permit, so it was like a partnership. I'm just waiting for him to retire now.
>
> Interviewer: So do you fish with your dad now?
>
> Fisherman: Yeah.
>
> Interviewer: Okay, but you're hoping to get your own permit—
>
> Fisherman: Yeah, I think—my dad's going to retire—I mean, this will probably be his last season on the boat then he'll transfer the permit to me.
>
> Interviewer: Oh, okay. Gotcha. And would you buy it from him?
>
> Fisherman: Yeah, I mean he'd give me a deal, for sure.
>
> Interviewer: Yeah [laughs]
>
> Fisherman: I'm not going to pay $190,000—
>
> Interviewer: 'It's market value!' Yeah, would you do a lease-to-own kind of thing? Or do you think you'd—
>
> Fisherman: Yeah, he'd come up with the price, and I would just give him either a percentage or say $10,000 or 25 percent, whichever's more every season…Until the debt is satisfied.
> —Naknek drift fisherman, 28 February 2015

2. Family

2.1. Family as Foundation

Family is how most of the interview participants in Bristol Bay began fishing, and how many of them fish now. It seems rare that people who are actively engaged in the fishery today didn't start with at least one family

member. Families are a source of rights, capital, knowledge, and cultural practice. Traditionally, the eldest son or daughter inherits the fishing operation from the parent(s) or grandparent(s), who, at the current moment in history, may have been initially allocated a permit during the implementation of limited entry (this number, of course, will decrease to zero in due time). Somewhat less "traditional" is the case in which an adult child shows more interest than their siblings in carrying on the family business, which is becoming more common with the increase in outmigration of people from fishing communities. This order of events has created a situation in which permit holders looking to retire may not have any children who are interested or able to take over. Also, having a desire to bring children (whether they've been born yet or not) into the family tradition, and eventually pass on the operation, embodies the family values associated with commercial fishing in Bristol Bay.

2.2. Changes in Fishing Families

That said, many older fishermen recognize that that pattern is changing; sons and daughters might choose to do something else in the summer time rather than fish (whereas years ago there were very few options for kids to earn money outside of fishing). Instead of their kids working on the boats, captains will hire others in the community (if they're not already fishing with their family), or non-local high-school/college age kids from Outside. This will be covered in more depth under crew/roles, but the short of it is that many local captains feel that because local kids may have other opportunities or can just go home if fishing sucks, Outside kids are a safer bet. This is, of course, not true for everyone.

Also changing is how families contribute to the household. What's the expected contribution of children to the winter supply of fish, the chores around the house, etc. and how are these familial responsibilities/expectations are changing? It seems that there is less pressure on kids today to help with the family business out of a lack of necessity. Years ago, before government and non-fishing jobs were available (relative to the low to moderate level of outside employment opportunities now), fishing incomes and subsistence fishing were crucial to avoiding familial/household food and cash shortages. Maybe these shifts aren't driven by necessity (or lack thereof) as much as they are a part of a larger cultural trend of letting kids be kids rather than little adults. These ideas about parental expectations of their children wax and wane, with one generation seemingly rebelling against the ideas of the generation that raised them.

2.3. Families Fish Together

Our qualitative data also suggest that family fishing operations are, and likely have long been, constituted by close and distant relatives. As is true of rural and remote areas in general, family ties and histories are long and interwoven. Relatives come to Bristol Bay seasonally from far-off places or the next village over, regularly or opportunistically on an interannual basis. During the fishing season and across seasons, family members shift around on boats and sites, going where they're needed, especially in the case of what I've called so far "family cooperatives". There are several examples of this system in the set net fishery. One or multiple families purchase permits jointly and put them in the names of family members, though I am not yet clear on how this is decided. It's possible that there is some sort of hierarchy, with the operations person at the top, directing logistics and placement of people and gear, and a site leader of sorts who directs the day-to-day fishing activities. Who fills what role might be partially decided by skills and abilities of the individual, or age and role in the family. I don't know though; that's

speculative. But what's interesting is that it's essentially a corporate model populated by kin-based employee networks. There are examples too of how family connections and the fluidity of fishing operations create opportunities for new entrants. The odds are good that a local person with a large family is able to step in when one family member is unable to fish a site or a permit for a season, and although that doesn't allow them start their own business, it provides experience and knowledge that becomes valuable down the road.

2.4. Status of Fishing Families

The level of prestige and power that a family holds, especially with respect to fishing, bestows a particular status upon individual fishermen. There are entire families of highliners, and I would suspect that there is a (whatever the word is for a pair of things that affects and are affected by one another) causal link between their fishing success and their status. This phenomenon was evident when I would ask interviewees to recommend other fishermen to talk to. Fishing families intermarry (e.g., TOB, SJB, BB), and it seems that that can also boost the position of family members in the community/the fishery. History among fishing families, disputes, double-crossings, etc. also factor into the positions of families and individuals in interpersonal relationships and within the larger communities. For instance, how a permit transaction went down between a family member decades ago has ramifications for that person's descendants decades later in terms of entering the fishery (not always, but it's not outside the realm of possibility).

2.5. Family Dynamics/Dysfunction

The level and kinds of (dys)function within families has significant effects on how family fishing operations are run and passed through generations. For instance, divorces, fights over permit inheritances, and siblings with differing opinions on what to do with dad's permit are all examples of circumstances wherein a family member could be put at a disadvantage in participating in a family fishing business depending on the way those challenges are handled. Cultural norms and practices inform mediation and resolution in such matters. Litigation isn't common, it seems, among rural fishermen, but one example that was given to me was that of a father who passed away suddenly and without a will, and the sons were involved in a long legal battle with the father's elder relatives to determine where the permit would go.

2.6. Economic Links Among Families

This isn't a major theme, but it's worth mentioning: a couple of people alluded to the fact that as captains/PHs, they support their own families and also the families of the crewmembers they hire. Under the current fiscal state of buying into the fisheries, crewmembers are staying on longer with captains and starting families (because people are transitioning to the captain's chair in their late 20s/early 30s at a slower pace than ever before) with which they must support with their deckhand earnings.

> "It's really tough for a vessel owner—and I'm a vessel owner—to—on my boat, I affect three sometimes four families, during the salmon season. I hire my son, I pay him, I pay his kids, I pay two other crewmen, and my family. That's four of us—four families. And I've been doing it for a lot of years and doing quite well until the price of salmon dropped to 50 cents a pound. And it's not—I can't ask the guy to stay the whole season if there's…cash and Bacon-Davis wages—he better go after it. Rather than fish with me. And I'll just haul in my boat—that's the way I look at it. I'd love to stay out there and I'd love to have a full crew. But how could you do it with—if you've got a conscience—ask them to 'oh come on stick it out, just a few more weeks'?"
> —Naknek drift fisherman, 25 September 2015

3. Community

3.1. Attribute

Anytime an interview participant mentioned a specific community (their own or another) it was coded as "community".

3.2. Seasonal Migration from Upriver Communities

Veteran fishermen recalled a time when a majority of upriver village residents would come down to the bay to participate in the commercial fisheries. One interviewee recalled a tent city called "Little Levelock", and noted that that has decreased drastically or stopped completely, depending on the village. Today there are certainly some permit holders that reside in those upriver communities, and do migrate to the fishing grounds every June, but their numbers have dwindled significantly over the past four decades.

3.3. CDQ/Non-CDQ Villages

Whether or not a community is eligible for the benefits provided by the Western Alaska Community Development Quota Program has serious implications for the ability of its residents to buy into the commercial fishing industry. All grant/loan programs, with the exception of the Permit Loan Program, are available only to residents of CDQ communities. Non-CDQ villages include Kokhanok, Iliamna, Nondalton, Newhalen, Igiugig, New Stuyahok, Koliganek, Pedro Bay, Port Alsworth, and Pope-Vannoy Landing. The negative impacts that this disparity (CDQ ineligibility) has on the communities include greater proportional permit outmigration, and not just for lack of access to capital for individual fishermen provided by the regional CDQ group, the Bristol Bay Economic Development Corporation (BBEDC). There is a sense that the influx of dollars to support and grow the fishing infrastructure in eligible communities actually has a greater impact on the relationship community members have with the fishing industry, and how those connections are changing as time goes on than the individual grants and loan programs available to CDQ residents.

3.4. Fishing Community Identity

A community identifies itself as a fishing community based on past and present participation in the commercial fisheries by its members, but how and if people decide to participate is in turn a product, in part, of their exposure to commercial fishing within their community. As permits and permit holders leave their rural fishing communities—contributing to the overall decline of local permit holdings—the opportunities for residents to engage with fishing become increasingly limited. Interviewees in communities with many permits locally held affirmed their community's identity as a fishing town, whereas such a strong feeling was less apparent in villages that have few permit holders left.

> "The reality is that—and a lot of these communities that used to be heavily—fishing activities—one of the main, if not the main economic driver, has dried up because of this transition [to limited entry] and nothing has replaced it. So it's become a lot harder for somebody in Ekwok—Ekwok is one of those villages. Two permits left in the village. Two drifts and one set. There [were] 15 drifts probably 30 years ago and 8 [set net permits]. And some young guy—it almost gets outside—it's more than 'god I wish I could go fishing, but all the guys around here are not fishing anymore.' It's now become, for a lot of these people…it's almost like this kid is living in Minneapolis, Minnesota. It's not even in his radar anymore. Because there's nobody around there that he knows well enough to want to go fishing with or to ask to go fishing, so it's not part of the culture in Ekwok like it was 30 years ago. And the question is: how does that kid a) get motivated, b) get knowledgeable of and c) find a place to get his feet on the ground to fish? That's a huge question and that's nothing you're going to

answer in 10 or 15 minutes or an hour."
—Dillingham fisherman and community leader, 23 September 2015

3.5. Place-based Fishing Identities

In a similar vein as community identity, the code 'community' encompassed people's conceptions of place, and the meaning and significance of places in Bristol Bay as related and unrelated to the commercial fishing industry. Communities were described as home, as a place where people feel safe and content, where their families have always been (or where their family has chosen to be), and where they continue commercial fishing and subsistence fishing, hunting, and gathering traditions. They were also described as places where significant change has occurred: interviewees recalled innocent childhoods growing up in their home communities, but question whether they are a safe and healthy place for kids to grow up today. When asked if she would want to raise her children in her home village, a fisherman replied:

> "I'd rather move to Wasilla than move out [to Togiak], maybe. Because when I was there I used to [substitute teach] every once in a while at the school, and elementary kids are like, snuffing and smoking—and I don't want my kid to grow up around that like I did when I was little. It wasn't as bad when I was little, but I don't think I want my kid to grow up like that. I loved growing up outdoors, you know."
> —Togiak set net fisherman, January 2015

Study participants also recalled more people, more families, and more local boats. Differences emerged between the way that residents of communities on the west and east sides of Bristol Bay viewed themselves, including that of Dillingham as a government town with not much fishing infrastructure (yet still strongly considered to be a fishing community), and of Naknek as the fishing hub of the Bay—the undisputed regional fishing capital. Interviewees cited stereotypes of the west side as a fishery populated by half-assed local fishermen, and the east side as a bunch of greedy, obnoxious outsiders.

3.6. Positive and Negative Aspects of Communities

The question was asked of most interviewees: what are the best and worst things about living in your community? Responses varied, but the positive aspects of living in Bristol Bay revolved around the freedom, subsistence, quiet, and security that characterizes rural places. Negative aspects of living in the Bay depended on which community the respondent was from, but village residents tended to express concern about the lack of local employment opportunities and its implication for young people being able to stay in or return to their home communities. Hub residents and village residents alike described growing drug and alcohol abuse problems among young residents and frequently lamented the high cost of living off of the road system.

3.7. Community Resilience and Sustainability

Sustainability of the communities in Bristol Bay hinges on the continuity of commercial fishing as an economic engine and as a source of livelihoods and identities for Bay residents. None of the interviewees from Togiak, Dillingham, or the Bristol Bay Borough (must go back and check Kokhanok interviews) expressed optimism that their community could survive if the commercial fishing industry were no longer a part of it. The language of death/dying was frequently invoked, turning the conception of their community from that of a group of people with similar geographies and identities into that of a living thing, of which individuals and livelihoods are vital organs. Community resilience was expressed in parallel to the resilience of the Bay's salmon runs. The notion

that as long as the salmon return, the people of Bristol Bay will remain and that threats to the sustainability of salmon (e.g., Pebble Mine, off-shore oil and gas development) posed similar threats to the region's communities.

4. Outside Employment

4.1. Links to Uncertainty

The foundational relationship between participation in commercial fisheries and in the non-fishing sectors of the regional economy is predicated on uncertainty. Fishing wages have always been uncertain, as is characteristic of global commodities, but the income earned from the six-week fishing season is not considered to be sufficient to support one's living expenses for the rest of the year (exceptions include deckhands that travel to developing countries in the off-season and live on the cheap, and high school kids). This might seem an obvious calculation to a fisherman from another part of Alaska, or someone not involved with the commercial fishing industry at all, but in interviewing long-time Bristol Bay fishermen, it became clear that in the first half of the 20th century, people could earn a year's worth (or somewhere close) of wages during the salmon season, and that could support not only a fisherman, but his family throughout the year. What has changed is an issue of financial and cultural shifts, the former I have described in the "financial" memo. Cultural shifts include the availability of amenities and technologies, and the changing style of living, from seasonal subsistence migration (with commercial fishing around the edges), to sedentary settlements in which government services (schools, hospitals, post offices, liquor stores) came in to existence. Cash infusions into the communities and the need to provide government services created an environment where outside employment needed employees, and created communities where fishing, trapping, hunting, and gathering were no longer the dominant lifeways. Compounding the uncertainties of fishing incomes are exvessel sockeye price instability and increasing costs of living.

Youth in Bristol Bay communities have more and varied opportunities for summer work outside of the fishery relative to previous generations. At one time, there were no grocery stores, youth camps, or summer internships for high-school age kids to work at, so even if fishing was uncertain as far as how much money one would make, it was certain that some money would be made (versus no money earned not working at all). Today, there are lots of BBEDC-funded internships and other educational programs for youth to participate in during the summer, all of which provide a guaranteed, fixed amount of pay. Incomes from fishing still haven't changed with respect to their unpredictability, so kids have a decision to make about the risks they are willing to accept, and often it seems that they choose work that will provide them with predictable earnings. Ancillary to the availability of BBEDC internships for young residents is the perception by a veteran fisherman that these types of opportunities are in part "training people to not be fishermen". Though this wasn't a common sentiment by any means, it hints at the larger trends of pressuring kids to get post-secondary degrees that may become a barrier to a commercial fishing career. This concept is more closely aligned with the code "education", which will not be covered in this set of analytical memos.

4.2. Characteristics of 75% Fishermen

The 75% figure isn't based on anything quantitative at all, and it may or may not be accurate, but a "75% Fisherman" is someone for whom 75% of their income give or take comes from fishing. They may seek irregular and temporary work outside of fishing, or live a more subsistence-based lifestyle than someone with a greater

proportion of their income coming from outside work. Essentially, they rely on fishing income to get them through the year. There are a number of different strategies that fishermen employ to make their incomes last, and one of those is to just catch a lot of fish. Highliners who put in 200,000 lbs. can, in a decent price year and without hugely burdensome debts, can be 75 or even 100% fishermen. Another strategy, which was described to me by a highliner in reference to his early fishing days, is to live frugally, be resourceful, and take work when it comes along.

4.3. Diversification

Bristol Bay fishermen use outside employment in a manner similar to the way that other Alaskan fishermen use other fisheries: to diversify their income sources. Bristol Bay, however, offers fewer opportunities to participate in other fisheries while remaining in the community. Ist is the curse of the two-fishery system. There are other fishery opportunities (e.g., the federal halibut fishery), but they are generally not lucrative and therefore make up a very small share of overall fishery revenues and participation.

4.4. Conflicts Between Fishing and Non-fishing Work

For those that do have outside employment, there is often tension between the need to retain that employment for the financial security it provides and getting the necessary time off to go fishing for 2 to 6 weeks in the summer. Some local employers are more forgiving than others, and certainly more forgiving than employers outside the region. For instance, Bristol Bay Native Association employees are allowed subsistence and fishing leave (although I don't recall how much). Interviewees told of employees taking off work at the regional commercial airline to go fishing, only to return and find their job filled by someone else. The level of flexibility offered by local employers has waned in recent decades, as the region's businesses and governmental organizations become more modernized and enveloped in the globalized world. The continued operation of their business throughout the fishing season is placed ahead of the need and/or desire of their employees to participate in the fishery.

4.5. Outside Careers vs. Jobs

People return to their home communities (seasonally or permanently) but their degrees or work experience make it challenging to find a local position that is suitable. It might actually be easier for someone who has many varied skills (e.g., carpentry, gear hanging, mechanical knowledge, teaching) to function well in a place with few career-track employment options. Careers are more limited in availability than jobs in general, though even temporary or unskilled positions are at a premium in small communities in Bristol Bay. Paradoxically, in communities where career positions aren't limited (e.g., Dillingham), the opportunities for someone to find a career for which they've been trained are limited.

4.6. "Real" Work

What is considered to be "real" work is certainly context dependent. Bristol Bay residents—fishermen and non-fishermen alike—recognize the skill, determination, and mental and physical strength required to be a successful commercial fisherman. However, those who are unfamiliar with the commercial fishing industry (e.g., geographically distant relatives of fishermen) might view a Bristol Bay fisherman's work as part-time or less demanding because of the condensed nature of the fishing season. One interviewee told of a time when her elderly mother was ill, and the fisherman's siblings assumed that because she didn't have a "real" job (i.e., not an office job), she would be able to take time, travel to the Lower 48 and care for their mother more easily than they would.

To further round out this conception of "real" work, it's important to think about how fishermen view outside work. The ideas of freedom, independence, and "being one's own boss" characterize self-employed fishermen, and typically do not characterize non-fishing employment.

4.7. Working and Fishing

The commercial fisheries in Bristol Bay offer a unique opportunity that few other fisheries do: it is actually possible to fish the summer salmon season and hold an outside job for the rest of the year (whether that's logistically possible for a given job is another issue, but the fishery is conducive it). This is a truth and a way of framing the nature of the fishery; in a chat with Dillingham's mayor (who is also the director of the BBEDC permit brokerage program), she and I circled around the idea that what the fisheries might be suffering from is a bit of a PR problem. The length of the Bristol Bay fisheries has condensed through time to a peak four-week season, limiting opportunities for fishermen to earn income during the spring king season and the fall silver season. This has traditionally been viewed as a disadvantage to fishermen entering the industry, but it's just as easily spun 180 degrees to appear as an advantage for those who are interested in doing other kinds of work in addition to commercial fishing. Both things are true, of course—it is both an advantage and a disadvantage—but pitching the career of fishing in Bristol Bay to local youth as something that allows one to do something else, too, is probably a more appealing message than some of the doom and gloom rhetoric that's been swirling around the region since the early 2000s.

4.8. Teaching and Fishing

There is a seemingly natural pairing in teaching and fishing careers. A couple of veteran fishermen echoed my sentiments on the matter, and questioning why, in a broader sense, do young, local—and especially Alaska Native people—not pursue teaching careers? I haven't yet gotten any insight into this question, but I have a couple thoughts as to why it might be the case that locally raised teachers are underrepresented in rural schools. First, the number of teachers in the general population, compared to the rest of the thousands of disciplines that people choose to go into, is small. What are the odds that in a random draw from a small population (i.e., a village) the number of teachers would be any proportionally higher than a draw from a large population? People have all kinds of interests and desires and conceptions of meaningful work, and a small number of people find that teaching is a good fit. My second thought is that there were and are likely cultural repercussions and patterns at work. For instance, formalized schooling was brought to rural Alaska by white missionaries in the late 19th/early 20th centuries, and so models of locally raised and Alaska Native teachers have been historically rare. What does the mental image of "teacher" formed by young local kids look like, given that most of their teachers are young white men and women that come from Outside?

> Fisherman: Well, one of the things that…I noticed when I worked for [my first company], I had all the Native villages in my territory, and all the teachers are always non-locals. And it's still the same way. I mean, [Togiak is] losing 8 teachers this year—half our teachers are moving on. They just have an adventure for a year or two and then they move to another adventure. Then education is hurting because of that. And my idea is that: why don't some of the young people become teachers? Not just one every four or five years, but enough to—we have enough rural schools that all the teachers could be rural teachers from their villages. But that sure is not happening…There's getting to be a few that are actually taking advantage of that position, but there's probably 20 more jobs that we can take.

Interviewer: Yeah, and it seems like such a natural pairing with fishing, too. You get out of school in middle of May, and then—

Fisherman: Go fishing…The teachers live in—say this is your apartment, you go out in the hall and you walk down a corridor, and when you open the next door, you're in the school and then there's doors going off. The houses that are 40 feet apart, the corridor just goes down the block—everybody walks—they never go outside. Then they bring their groceries in on the barge in the summertime and if they want to stay in their school environment…We'd like to see them come out and join the community and be involved with the people in the community, but it doesn't really happen that way.
—Togiak drift fisherman, 6 May 2015

4.9. Lack of Outside Employment

The relative unavailability of jobs in Bristol Bay villages is a source of financial hardship, threats to individual wellbeing, and challenges to community sustainability. Often, residents of villages (e.g., Togiak and Kokhanok) and less frequently in hubs (Dillingham and BBB), must move themselves or their families to population centers in Alaska or elsewhere to find work. The problem of having few employment opportunities in a village seems straightforward, but the implications for individuals and the strategies they devise for overcoming those challenges are unique.

"There are, I would say, deckhands and there are captains, too, right now that are struggling in being in the village, as there are not a lot of other opportunities for employment. And if you are a tried and true fisherman and you're not able to make ends meet with your fishing, you need to have something to fall back on and there really isn't a whole lot for people to fall back on here. So a second job, I guess, is—for a lot of folks is required and that would be a big struggle too I think."
—Kokhanok drift fisherman, 25 February 2015

5. Processors

5.1. Relationship Changes Through Time

Specifically, what has emerged from our interview data is the ways in which the nature of the relationship between a fisherman and the processing company he or she fishes for has changed. The early period of the commercial fisheries, in the late 1800s, was characterized by outside canneries, based in San Francisco or Seattle, colonizing the processing sector and establishing infrastructure for the harvest and canning of salmon. Everything was imported: cans, boats, machinery, cannery workers, fishermen. Fishermen were completely dependent upon the canneries for their operation (which really wasn't theirs at all; they were more like hired help), and canneries constituted hegemonic, albeit mostly benevolent, rule. Local fishermen were shunned from the fishery during this period; when the ban on power boats was repealed in 1951, the independent fleet grew and local fishermen were able to wedge their way into the harvesting sector. It was the introduction of power boats (and the canneries' collective desire to get out of the boat-leasing business) that began the shift from canneries as hand-holders to hand-slappers. Now, fishermen characterize their relationship with their processor as good or bad depending on their individual experiences, but the subtext is the same for most fishermen: whether the relationship is good or bad, all canneries possess the same bottom line, and their loyalties lie with their shareholders—not their fishermen. Today, fishermen are responsible for financing their own operations, with some help from their cannery if their production or social capital allow for it. A young person—discriminatory practices aside—before and up to a certain point during the power boat era could lease a cannery boat for a fee, pick up a cannery-owned net, find a fishing partner,

and be out the door on the way to a career in commercial fishing. No part of becoming a commercial fisherman today is as simple or as financially accessible as it was then.

5.2. The Company Store

I don't know exactly how many times I heard the line from an old song: "I owe my soul to the company store" during this fieldwork, but suffice to say it is on the minds of commercial fishermen in Bristol Bay. The truth in this expression manifests in the level of control that fishermen feel they have over the operation of their fishing businesses, when some of the most critical aspects (e.g., price of salmon, delivery limits) are determined by the processor. There was however a time when canneries were quite literally the company store, and some dots on the map were company towns. Clark's Point, for example, began (or so historians believe) as the site of the first cannery in Bristol Bay, founded by John Clark in 1889. His store, the Alaska Commercial Company, was no doubt the "company store" of the time. As cash and modernity moved into the Bay, it seems that capitalist-minded entrepreneurs, both local and non-local, could stand to compete with the company store and the local economies diversified—in some places more than others.

> "Back in the day, the canneries had everything. They had nets, they had boats, there were—they were company boats, so basically you owed your soul to the company store. That was a saying and I don't know if I got it right. You sold your soul to the company store. It's coming around, it's evolving. Boats are individually owned, back when I was a kid, you'd go to the cannery and you'd buy your net. And it was complete. But they're pretty spendy. Now you buy your own gear. You go find your own individual to hang it or you hang them yourself. But there's still—like Trident owns Lummi down here, and Seamar is their own little company. All this money that they generate leaves. So what I'd like to see is more locals—local entities, and maybe they could get BBEDC start helping more local business start up the service industry. Because that's really where all the money is, I believe."
> —Naknek set net fisherman, 26 February 2015

5.3. Consolidation in the Processing Sector

I'm in the process of digging up quantitative data on the processing firms in the Bay, but the qualitative data suggest that a tremendous amount of consolidation among processing firms has occurred. The passing of the Magnuson-Stevens Fishery Management and Conservation Act (see memo on "Management" for more detail) in 1976 pushed the Japanese high-seas fishermen out of the newly formed US exclusive economic zone, which left the Japanese to devise alternative means of supplying their domestic market for sockeye salmon and roe. To do so, Japanese seafood processing and distribution firms bought into or bought out completely existing US processors. The extent to which this occurred, and on what time scale aren't exactly clear, but our interviews reference a period in the early 1990s when trade sanctions with Japan were lifted under President Clinton in which much of the processing sector was purchased by Japanese conglomerates, such as Nippon Suisan and Nichiro. However, the specifics aren't as important as the impacts of consolidation on Bristol Bay fishermen. Consolidation, in the minds of fishermen, is linked with price fixing and collusion between firms. When there are fewer firms, organizing and sharing business practices (to put it lightly, since these activities have never been confirmed with any certainty) is much simpler and carries less risk of defection. The effect of consolidation on exvessel prices will be discussed in more detail under the "markets/prices" memo.

5.4. Processor Support

Though fishermen have alternately and simultaneously positive and negative perceptions of their canneries, it is abundantly clear from the data that there are local fishermen who depend on the financial support provided by their cannery. Who exactly these fishermen are is likely a complicated picture, but they are likely to be those whose margins are relatively thin, without outside income, having bad luck, or all of the above. That said, processor support seems to be conditional on trust, productivity (to some extent), and kinship or legacy (i.e., if Grandpa fished for the same cannery for a long time, I probably have a better chance of getting what I need). The processing companies vary as to which kinds of financial support they will provide, including vessel acquisition/upgrade/repair and preseason expense loans. Some processors are thin on the services and support but in turn offer (slightly) higher exvessel prices to their fishermen.

5.5. Finding Market/Put On Limits

One of the most distinctive results to emerge from this study with respect to processing companies is that of difficulty for new fishermen in securing a market. Securing market, or entering into a contractual sales agreement before the season, is seen as challenging for new fishermen unless they have some family or fishing connection. For instance, a new captain may be successful in getting on a fleet list at a cannery if they previously crewed for a long time with a well-regarded captain at that same cannery. Assuming a fisherman has secured a market before the season begins, the next challenge becomes making a profitable season when being "put on limit". The processing sector in the Bay frequently becomes plugged with salmon during a pulse of returning fish, unable to process the entirety of the pack caught by the fleet. When (or ideally just before) this happens, canneries announce that fishermen on a particular list (B list, C list, D list, etc.) will be "put on limit", or barred from delivering fish.

5.6. Canning Cartels

I'm borrowing a phrase from Karen Hébert in describing the depth, breadth, and history of control imposed over the Bristol Bay salmon industry by the processing sector. In the late 1800s, the Alaska Packers Association formed, and by 1894 it had gained membership by 90% of the canning firms and 72% of the total pack of Alaska salmon (Cooley 1963). Cooley goes on to describe the outsized influence of the cartels in excluding resident and local fishermen from Bristol Bay fisheries until the 1930s. This legacy is evident from interviews with veteran fishermen who grew up in the bay. Some recalled, from a firsthand perspective, how it was understood that local fishermen were not allowed to work in the commercial fisheries in the Bay when they were very young. Even today, the level of control and influence that processing companies have over when and how people fish and how much they earn for their pack is astonishing, though it is very much taken as normal among many Bristol Bay fishermen.

5.7. Graying of the Processing Sector

This is not a major element of the code "processors", but it was brought to my attention that many of the specialized positions, including mechanics that can work on old canning machinery, and management positions in the processing sector are experiencing an aging trend as well. The reason that this may be of some importance is that technical and some management jobs may present an opportunity for Bristol Bay residents to enter a career that allows them to live in the region or spend summers there. My guess is that, like the harvesting sector, the number of workers that come from outside the Bay and Alaska far exceeds local hires in the processing sector.

5.8. Resistance to Quality Improvements

It was suggested during interviews, though not with any regularity, that the processing sector was initially resistant to the chilling/icing/bleeding methods that have greatly improved the quality of Bristol Bay sockeye. I don't yet have enough of an understanding of how quality works to assess this statement: how it's graded, what proportions of fish are categorized as 1's, 2's, etc., what happens to each grade of fish, what the statistics on quality of Bristol Bay salmon look like through time (i.e., has there been an actual change?). Bristol Bay seems to be a niche market among Copper River kings/troll-caught Southeast salmon and Yukon "keta"/pink salmon; Bristol Bay fish are a beautiful-fleshed fish that tend to be cheaper because of some of the inherent quality limitations resulting from the short duration of the fishery, the high volume of salmon delivered and required to be processed per time, and the remote, roadless location of the commercial fisheries. Cheap, high quality salmon? If the processors don't believe that funneling money into equipment and practices will make them marginally better off than without quality improvements, there is no incentive for them to do so (i.e., will the steps taken to improve quality result in a large enough shift in second sale price of salmon products to warrant their cost?). Market limitations are surely a factor in supporting or quashing quality improvements, i.e., will consumers pay more for a slightly higher quality fillet of Bristol Bay wild sockeye? The answer is out there, presumably; it just didn't come out of these interview data.

Interviews revealed that there are particular processing companies that emphasize (and have for a long time) quality in the fish they purchase, and those that do not. Ocean Beauty, for example, was described by a fisherman on their fleet list as being in the former category of companies:

> Fisherman: So I say quality has improved…And I think Ocean Beauty always talked about quality to us, because I remember they had a joint thing—it was Ocean Beauty, Nelbro—and we could deliver to either truck that would be down there. And then Nelbro fishermen—they didn't even have to wash their fish. But Ocean Beauty told us that we had to wash our fish. So it was quality from the beginning.
>
> Interviewer: Well that's interesting. They seem like they were kind of the leader.
>
> Fisherman: Right, I thought so…I think they were the first company that said, 'you could ice your fish for us' as setnetters. Because the other setnetters, they don't have the opportunity to ice their fish. We have neighbors that are fishing for different companies—
>
> Interviewer: They just won't buy it? Or they won't give a—
>
> Fisherman: Yeah.
>
> Interviewer: —bonus for it.
> —Naknek set net fisherman, 27 February 2015

5.9. J-1 Visas, Worker Welfare, and Community

This topic should probably be cross-listed with community wellbeing, but I think the root of the issue lies in the corporate labor practices that the processing companies—in Bristol Bay and elsewhere, and in other sectors of Alaska's economy—have used since the beginning of the program. The J-1 visa is a work-study exchange program run through the State Department and allows companies in various sectors of the economy to recruit foreign students for temporary work in the US. The seafood sector was removed from the J-1 visa program in 2012, though it has been extended through 2016 thanks to the political support of Senator Lisa Murkowski. Getting to the point: there is

a good amount of friction between young, foreign J-1 visa workers (and also American college students from Outside) within Bristol Bay communities during the fishing season. One anecdote related to me by a lifelong Naknek resident made clear that seasonal workers in processing plants—some, if not most, companies—are treated unfairly by their employers, and the trickle-down effect is a group of disenfranchised young people in an unfamiliar place with an axe to grind. The Naknek man's story began with a group of foreign kids taunting his wife and nearly getting into a fistfight with him, while it ended with him listening to their stories of what an awful experience they had had working in the plants. He attributed their poor behavior and lack of respect for their temporary home community to the lack of respect they had been shown as employees of the Bristol Bay processing sector. Of course this is not exemplary of all individual workers and of all local residents' interactions with them, but it illuminates an interesting connection between the labor practices of the processing sector and the broader community-level impacts they have in the region.

6. Permit Dynamics

6.1. Market Transferability of Permits

This code describes how permits move through families and communities, within and outside of the Bristol Bay region, individually and collectively. A central tenet of the limited entry act was that fishing rights should be transferable, and not revert back to the state at the end of the permit holder's fishing career. There are certainly reasons for and against transferability of permits, and ensuring a fisherman's ability to capitalize on their fishing investment upon their exit from the fishery was one reason supporting transferability.

6.2. Outmigration of Fishing Rights

The loss of locally held fishing rights is a pervasive problem in rural Bristol Bay communities. Most, though not all, villages in the region have experienced severe permit outmigration, i.e., movement of permits and permit holders away from the community. Hub communities have experienced less severe declines in local permit holdings. Specifically, interviewees discussed the transfer (i.e., sale) of permits to non-local and non-resident fishermen. Ethics and local customs have formed around the practice of selling to "outsiders"[5]. Initially, when limited entry permits were still relatively new, getting the best price—which was typically not from a local resident—was the main objective in selling one's fishing rights. As the permits left communities, however, the concept of selling locally gained support. While most interviewees said that keeping permits in the hands of local residents is an important social norm that is typically upheld when permits are transferred, others posed the question: would someone admit to selling their permit to a non-local, given the gravity of breaking such a norm? These interviewees suggested that transfers to non-locals still occur, but that people usually remain quiet about them.

> Interviewer: In Kokhanok, do you think [the outmigration of permits] is something that…happened slowly over time, or do you remember like distinct periods of loss?
>
> Fisherman: '80s was the time of the biggest loss, late '80s. That's when the older—the guys who qualified for the permits were either selling off or turning them over to their kids. Most of their kids either, number one, had no interest, or number two, were addicts of some kind. So they sold them off, number one, to pay for their habits or just have a good time in Anchorage, one or the other. A few people sold them off that—actually, I can think of one that did it right. He sold it off, they put it in the bank and he kept it long enough until he was

[5] See Section 12.4 Local/Non-local: Keeping Permits Local

qualified for social security.
—Kokhanok fisherman, 26 February 2015

A second form of outmigration of fishing rights occurs when a permit holder or family of permit holders moves away from their community. Typically, people move to Alaska's urban centers in the Southcentral region of the state or out of state, though the reasons for doing so are varied. Some seek better educational opportunities for their children, some move to find work, some move to be with family members. Statewide, the number of permits that have moved from rural areas local to the fisheries (i.e., communities in close proximity to fishing districts of a given fishery) to urban areas or out of state has contributed more to the loss of locally held permits than has sale/transfer of fishing permits to non-locals and non-residents. In Bristol Bay, however, the opposite is true: people are selling their permits to outsiders more than they are moving away from the region. What this means for access to and participation in commercial fisheries is unclear at this point, but it is an interesting and significant departure from statewide patterns in local permit holdings.

"[The fishing permits have] gone with the people that used to live here. A lot of them. My grandmother—who fishes—my mother and my grandmother used to fish side by side. Those—I have my mother's permit. And my niece has—not my niece, my cousin—has my grandmother's permit. And her mom has her permit still. So those permits haven't been sold, they've just been passed on. And most times it's just like that. I know that there have been some sales of permits. There was a gal—she sold out and somebody local here bought that too. So, there is an effort. At least I think in setnetting—that tries to keep it here. But in drifting, not so much. Drifting, there's a local guy that lives in South Naknek, he just sold to somebody—he tried to hold on to the permit to give the sale to his nephew, but the—his nephew was trying to go through BBEDC and the process was taking too long so his uncle said 'I gotta get rid of it.'"
—Naknek set net fisherman, 26 February 2015

Something that was mentioned only once, but it's worth remembering, is that permit outmigration isn't always a one-step process. The movement of permits from a Bristol Bay community may be sequential (e.g., son inherits permit, moves to Wasilla, returns seasonally to fish during the summer for a while, then sells to non-local after years of not being able to fish permit/leasing).

6.3. Emergency Medical Transfers

Also referred to informally as "leasing", emergency medical transfers (ETs) are used when a permit holder experiences a temporary medical condition that prevents them from fishing their permit in a given year. The permit holder is allowed to set the monetary conditions of the transfer; for example, the cost to the transferee as a flat rate or a percentage of the revenue. The Commercial Fisheries Entry Commission sets strict guidelines regarding how and when a permit is subject to an ET, but anecdotally, these guidelines are fudged and loopholes are found. Though ETs are not supposed to be used for chronic conditions, it seems that many elderly permit holders reapply for ETs to allow family members to fish their permit and provide them with a source of income. Leases are commonly advertised on closed Facebook groups, with an invitation for the interested party to send a private message. Though fishermen seem to be aware of the ET regulations, there is a culture of using leases for purposes that they aren't necessarily intended for. Irrespective of the moral and legal standing upon which ETs are made, they provide a pathway to the fishing industry for new fishermen who have experience crewing and running boats, but aren't ready quite yet to invest fully in their own operation.

6.4. Permit Stacking and Dual Permits

How to maximize the economic efficiency of one's fishing operation is a puzzle that many fishermen try to solve. Permit stacking (in the set net fishery; ended in 2012) and dual permits (in the drift fishery; implemented in 2004) allow fishermen to fish more than the maximum amount of gear, thereby increasing the amount of fish an operation is able to catch and the earnings it brings in. According to Alaska statute, an individual person may hold two limited entry salmon permits but only fish one of them. However, regulations have been passed by the Board of Fisheries (and have recently been rejected) to make allowances for permit stacking and dual permits.

Between 2009 and 2012, set net fishermen could hold and fish two limited entry permits, on a single site or two sites. Controversy continues to permeate discussions of set net permit stacking; essentially, there is the view that permit stacking is akin to crab rationalization in the Gulf of Alaska, and would consolidate fishing rights into the hands of the few (and the hands of those able to put up capital to purchase a second permit). There is also a competing view that locals, with the help of BBEDC, are at the greatest advantage under a scenario in which people can legally own and fish two permits. The Board of Fisheries voted down proposals in 2015 to again allow permit stacking in the Bay for set net fishermen. Though only a few of the interviewees made reference to permit stacking, those who did suggested that for setnetting, the advantage would go to those who could afford a second permit while expressing skepticism that those people would be local fishermen.

Drift net permit stacking (called "dual permit" operations), however, functions somewhat differently and tends to be viewed in a more favorable light across groups of fishermen than does set net permit stacking. Fishermen may still only own a maximum of two permits and fish only one, but they may join forces with another permit holder on a single vessel and operate 200 fathoms of gear, rather than the 150 fathom-limit imposed upon single-permit operations. The difference between the two gear types with respect to permit stacking that emerged from the data is that drift fishermen often use dual permits to make a step-wise entry into the fishery. For instance, one interviewee purchased a permit, and spent the next couple of years "D-ing" (i.e., drift permit stacking) on her father's boat while she saved money to eventually buy out his vessel and gear or buy her own. D-ing is seen as a way among young and new fishermen to dip a toe into ownership in the fishery, while circumventing the initial investment of rights, a vessel, and gear. Given the nature of set net permit stacking and the fact that one individual fishes two permits, there is relatively little opportunity for a young person to couple with an experienced set net fisherman to both provide experience to the young captain and cost savings to both permit holders.

6.5. Subtleties of Permit Transfers

There are many facets of permit transfer activity, including the regulations and the reasons why transfers occur the way they do within the multitude of buyer-seller pairings. First, it was expressed through interviews that there are starkly contrasting views of whether a permit should be gifted to young family members or young people should rightfully purchase that permit from a family member. Views were as unique as the individuals offering them, but there appears to be a group of fishermen that hold firm the belief that kids, including their own, should work for what they have in life, and that when a son or daughter (or niece or nephew or whatever) purchases a permit from their parents or elder family member, the elder is then provided with some sort of financial stability in their retirement from fishing. Others have equated the gifting of permits to children with tradition; to sell a family

permit would be akin to asking Grandma's heir to pay for her jewelry collection. There are shades of gray, too, in between. A common practice, described elsewhere in these memos, is that of selling a family permit to a son, daughter, etc. at a steeply discounted price, with the caveat that a portion of the earnings from fishing that permit is to be reserved to support the living costs of the retiring family member.

6.5.1. Norm's idea

In a conversation with Norm Van Vactor, CEO of the Bristol Bay Economic Development Corporation, he shared an interesting idea with me. His thought, given what he'd seen as a processing plant manager and during his time at BBEDC, was that it might be beneficial for individuals and the region in terms of permit retention to let people lease until they're 25 years old. He had seen young, skilled, and ambitious fishermen that were determined to purchase their own operations suffer from a lack of financial education and experience managing a small business. The outcome in many of these cases was that the permit this person purchased would be sold, and so in an effort to mitigate the risk of a permit leaving the region in this fashion, Norm suggested that a provision in the leasing regulations be added to allow young people under the age of 25 to lease from a mentor or family member. His reasoning for the age limit of 25 is that is age at which neurological research has shown that the adult brain is fully developed, including the prefrontal cortex (the area of the brain controlling complex cognitive behavior and decision-making, among other things).

6.5.2. Brokers and "Connectors"

An interesting concept that arose during the interviews was that of informal permit brokers, with reference to one well-known person in the region who provides such services on a volunteer basis. I didn't think to ask about brokers or "connectors", but they seem to be a potentially important conduit for transfer of fishing rights within communities or the Bay region and a protective measure against rights going Outside.

> "There's a couple of guys that sort of help—I wouldn't call them brokers, I'd call them connectors, maybe?...Plus BBEDC does that too."
> —Dillingham set net fisherman, 21 September 2015

In additional to informal permit brokerage services, BBEDC offers a Permit Brokerage Program that accomplishes many of the same objectives. They help would-be transferors file intent-to-transfer and transfer survey paperwork, and line them up with potential buyers in the region to the extent possible. Of course, the seller may choose whichever buyer they want in the end, but both formal and informal brokerage services try to make arrangements that benefit both the seller and the buyer, and the community as a whole by retaining permits in the region as much as possible. BBEDC's permit brokerage program also provides technical assistance to permit holders wishing to make arrangements precisely so that their permit does not have to be transferred.

> "It's not financial, it's technical assistance, and there are both the IRS and the State can put liens on permits. They're the only two groups that can—other than CFAB, if you have a loan with CFAB. But child support and taxes are two big problems and once they put a lien on a permit, it becomes more difficult for the person to do anything with the permit. I mean they can fish them, but child support and IRS can put a lien on the proceeds and so fairly often what we're doing in the permit brokerage is just trying to help someone wind their way through that. We're not attorneys, we can't do anything with that. But we can try to help do temporary agreements to allow them to fish the permit, partial payment to child support, partial income to themselves and so we do that for any resident—any watershed resident."
> —Alice Ruby, BBEDC Permit Brokerage Program Director, 22 September 2015

7. Markets and Prices

7.1. Finding Market

Negotiating with a processing company to buy fish on a contractual basis is one of the most significant concerns that emerged from interviews with young/new fishermen. Why "finding market" constitutes such a formidable barrier isn't yet entirely clear; however, the most basic reason that this phenomenon occurs seems to be that there are more than enough fishermen available to catch the quantity of fish that the processing sector is able to process. Processing companies, then, are able to pick and choose among the fleet, and they favor the "highliners", or those that can produce the most fish from a single operation. There is also risk involved in taking on a new fisherman, especially one without a family connection (more on that later). It's nearly impossible to know how productive a new, unknown fisherman will be because they necessarily have no proven catch history.

An easy way to overcome this specific barrier is to be related to someone that has fished successfully and productively for many years with a processing company, then ask to join the fleet list at that company. Of course, my glibness is making the point that there is a sort of caste system at work here; if you haven't had the good fortune of being born into a fishing family—and a productive one at that—finding a processing company to buy your fish could present a challenge to entering the industry. That's not to say that a fisherman who isn't the son of the plant manager's favorite captain couldn't get on a fleet list; the flip side to this hurdle is that as soon as it is overcome, the new fisherman must reconcile his place on that list (A-list, B-list, and so on) with the fact that eventually, the fleet will be put on limits, and the pain will not be spread equally. D-list fishermen are the first to be restricted from delivering their catch, followed by C's and B's. This type of sorting and classifying of fishermen makes it especially difficult to catch and deliver enough fish to make the season—and their business over the long term—financially viable.

> Interviewer: So you said that Trident was supportive when you wanted to get into the fishery, and they said 'okay, we'll buy your fish'. I'm curious though, do you think that if you didn't have that family history with them, would it—
>
> Fisherman: No way. I could, but I'd be like D-listed and go on limit every other day…So market…I should've said this earlier—market is a huge barrier…My cousin fished with his family in the Kvichak…didn't wanna do that anymore, so he wanted to come over here and fish, and market was a huge barrier for him…market and finding a site were a huge deal for him. And he's had—he's been fishing just as long as I have, if not longer. But those two things were big deals.
> —Dillingham set net fisherman, 2 October 2014

7.2. Exvessel Prices

There are several aspects of exvessel prices for sockeye salmon flesh that necessarily form intimate relationships with a commercial fishing operation. At its most basic, the price that fishermen are paid per pound of their catch determines how much money they are able to net at the end of the season. When exvessel prices are high, moods are elevated and motivation to catch fish runs high. When exvessel prices are low, fishermen question whether it's worth it to put their boat in the water. However, because prices aren't confirmed until the end of the season, fishermen may find themselves in a situation where they've spent a preseason advance or drained their savings to fish, only to find out that the price they're paid lands them squarely in the red for that season. It's possible

to weather this kind of defeat on an occasional basis, but prices tend not to fluctuate widely for many reasons[6] from year to year, and in order to keep oneself from falling deeper into debt, a fisherman may decide that it's not financially possible to keep fishing until prices go back up.

How prices affect whether or not a new fisherman chooses to enter commercial fishing isn't a black and white issue. Some take the perspective that if one sits and waits for prices to get better, they're falling prey to something they have no control over. Others choose to be somewhat more strategic, and buy when prices are low—knowing that permit prices closely follow exvessel prices—and wait for them to come back up before they start fishing. Others may buy in when prices (and permit prices) are high, knowing that at least they are likely able to earn enough from their catch to pay down their debts and put away some money. The qualitative data suggest that veteran fisherman, who have likely seen both high and low prices, believe low exvessel prices to be a disincentive for new and prospective fishermen (i.e., youth growing up in fishing communities) in choosing a fishing career. However, our data also suggest that many other factors unrelated to exvessel prices coalesce to influence one's decisions about how and when to buy into the fishery, that there may be no identifiable relationship between trends in prices and entry into the commercial fishing industry.

7.3. Peaks, Valleys, and Cliffs

I really cannot put into perspective what exvessel price volatility means for a fisherman's business, whether they are just entering or have been involved in the fishery for decades, better than Norm can:

> "One can fully anticipate some peaks and valleys, but what we just had was not a valley but we kind of fell off a cliff. And so if [I said to a prospective permit holder,] 'hey, you know, this a real viable fishery, you should really consider getting into it, and I know fish prices last year were $0.50 a pound and be prepared for a dip this year, but I think they're going to be about 90 cents a pound this year.' And you talk that through, and you explain why that's normal and why that shouldn't shock you, but then all of a sudden the reality is that his uncles and aunts and mom and dad are getting paid 50 cents a pound, it's like 'holy crap.' Can you really sustain the business at those price levels? And the reality is if those price levels were to persist, no, you couldn't. It'd be very difficult."
> —Norm Van Vactor, CEO Bristol Bay Economic Development Corporation

Another fisherman who is not new to the fishery but is a new captain, described her take on price volatility this way, in response to the question "what do you need to make a satisfying livelihood from fishing?":

> "I started out, I think we got 75 cents a pound when I started in 2010. And when I was on the driftboat we were getting 35 cents a pound. And looking at the people who went through what we all went through in the '90s with [price] fluctuation, I don't see myself being able to do that for the next 20 years. If we ever go back below 50 cents, I'm done. I can't—you can't do it. So, price stability."
> —Naknek set net fisherman, 21 April 2015

7.4. The "Disaster Years"

Ask any Bristol Bay fisherman under the age of 60 when the disaster years in the fishery were, and they are likely to describe the years between 2001 and about 2007. Certainly, there were other periods in less recent history in which prices or catches or both were low (e.g., the late 1960s), but the period that comes to mind for most fishermen is that in which farmed coho flooded the global salmon market and depressed the price paid for sockeye salmon. Adding insult to injury, east side fishermen in our study recalled being forced to fish inside the Naknek river

[6] See Section 5.6 Processors: Canning Cartels

mouth as a result of extremely poor salmon returns to the Naknek-Kvichak district in the mid-2000s. A veteran fisherman from Dillingham hypothesized that this period, and the doom and gloom it inspired, gave rise to the attitudes about the fisheries that young Bristol Bay residents imprinted upon and recall when commercial fishing comes to their minds. She, and others, reasoned that it is unsurprising that today's 30-year-olds, who were in their early teens and just beginning to dip their toes into the fishery during the disaster years, are averse to devoting their working lives to commercial fishing.

7.5. Global Salmon Markets

The dynamics of the salmon market, today and during the early 2000s, are far more complex than that which can be explained by the boom in farmed salmon production during the late 1990s. Some of the more cerebral and curious fishermen understood very well the independent fisherman's role in the enormous machine that is the global market for salmon flesh and roe. They linked the high-seas fishing effort by the Japanese fishing fleet to some of the poor returns in the late 1960s and early 1970s, and the effect that the Magnuson-Stevens Act of 1976 had in eliminating that effort through the establishment of the US Exclusive Economic Zone from 3 to 200 nautical miles offshore. A sizeable minority of fishermen also discussed the influence that Japanese markets have had on the processing sector in the Bay and on exvessel prices for sockeye salmon. Fishermen see themselves as perhaps slightly less foundational to the market for wild-caught sockeye salmon than the fish themselves, and as being subject to the whims of global supply and demand for canned and flash-frozen filets and hand-picked roe, with little recourse when the market does not behave in their favor. The only thing they can do in those instances is catch. More. Fish.

7.6. At the Bottom of the Value Chain

The disparity between the price paid to fishermen per pound of their catch, even in relatively good years, and the price that consumers pay in grocery stores and wholesale clubs has not escaped Bristol Bay fishermen. Though they surely understand that value is added to fish delivered in the round through processes of fileting, packaging, and shipping, for example, fishermen cannot reconcile the fact that what people pay in a grocery store is sometimes more than fifteen times what the individual whose labor and investment went into harvesting that fish was paid for it. There is a feeling of injustice; that they should be entitled to a greater share of that $15.99 per pound than they are currently getting.

> EA: Why can't they pay higher for fish? After that Japan incident you'd think the fish would go from eighty cents a pound to more than a dollar-seventy. I flew into Anchorage and I saw Togiak Seafoods fish…$16 an ounce.
>
> RD: What?
>
> EA: Yeah.
>
> RD: That's crazy. Where'd you see that at?
>
> EA: Wal-Mart.
> —Togiak drift fisherman, 4 October 2014

7.7. Small Processors

Many challenges exist for fishermen interested in direct marketing and for those who run small processing businesses. Economies of scale factor into decisions about whether it makes sense to spend the time, effort, and capital to process a portion of their fish to be sold directly to restaurants and specialize retail outlets at a higher exvessel price per pound than can be offered by the larger processing corporations. Some fishermen have been able to successfully direct market their catch with substantial help from family or hired employees, and others find the prospect so incredibly daunting that they have little to no interest in trying it. The few that do show interest describe frustration with learning the regulations governing food safety and processing, and with a lack of infrastructure available in their communities to support a direct marketing operation (e.g., frozen storage). Small processing companies, which operate in a very similar manner to commercial fishing business that choose to direct market their fish, face the same challenges as direct marketers, including high utility, labor, and shipping costs that eat away at their margins. The owner of a small direct marketing and custom processing business described navigating food safety regulations and the challenges of linking into far away distribution chains as difficult, but not discouraging; she firmly believed that more competition from small firms is necessary to chip away at the monopsony created by the larger firms in the Bay.

8. Motivation

What drives people to choose commercial fishing as an occupation? This code encompasses the reasons why fishermen love fishing, why they continue to do it despite its challenges, and how reasons to fish (or not fish) have been reshaped by broad sociocultural shifts.

8.1. Reasons for Fishing

Our study suggests that while there are commonalities among local Bristol Bay fishermen in what motivates them to fish, there are also stark contrasts. Most fishermen characterized fishing as a passion and as something that one shouldn't do if they don't absolutely love it. Others said that fishing is their lifestyle[7] and something they've always done, without ascribing emotion or sentiment to it. Fishermen commonly expressed a desire to do hard work, to which a career in commercial fishing is certainly well suited. Other qualities of commercial fishing work, including flexibility, self-determination, and independence, appealed to fishermen more so than office or other kinds of work. Like other professions, some fishermen admitted they were financially motivated to fish; however, most local residents were careful to distinguish themselves from "greedy outside fishermen". Rather, Bristol Bay fishermen who described being "in it for the money" framed this mentality as a truth that few others were willing to speak. They tended to claim that fishermen who said they didn't care about the money were lying. Finally, fishermen were motivated to fish because it is their family tradition, or in order to provide for their family, or to spend time together as a family during fishing season. One even bought into the fishery with the image in their mind's eye of sitting on the flying bridge, drinking coffee, while the kids pick fish or enjoy their time out on the water.

[7] See Section 15 Fishing Livelihood

8.2. Changing Parental Expectations

Have parents' expectations changed of the work their children should be doing, and how much, and at what age? From what I can gather, there has always been a sort of finger-pointing that has gone on between the generations, where the older claims the younger is lazy and making this country worse off. The younger claims the older just doesn't understand. That said, it does seem like—based on people's recounting of their own childhoods at fish camp or one veteran fisherman's story about feeding his father's dog team—there has been a generational shift in how parents perceive the level of work that is appropriate for their child. A lifelong setnetter from Naknek described her dislike of fishing work, its connection to the way her son feels about it, and the fact that they still expect him to help the family out by coming to fish camp. However, she perceives the work required (fixing the net, cleaning waders, cooking, cleaning, etc.) to be a lot for a sixteen-year-old boy.

> "I see the time of this 'graying of the fleet' as a change of mindset, I think. Culturally, and…even spiritually. I think that a lot of the parents—some parents it is still just normal to say [to their kids] 'you're doing it,' and a lot of parents don't encourage or make their children fish, and I have always made sure that [my daughter] knew it was a very important part of our history, and living and being from this region, and that it was—had to be engrained in her—it was a part of her. I would tell her that she was born to fish, even though sometimes she…would just laugh at me, but I think now she just thinks of it as being normal. Instead of just letting your kids be so much of an individual that they have…what they say, goes, I don't think there's any—ever been a time in any society where you let your kid just do whatever they wanted while you were out making a living. It was always part of a family thing, survival, effort to make sure that everybody was involved. Recently, I see it as parents giving an option to their children, and for me, I don't feel like there was an option—that was the only option, to me—it just seemed like it was natural and that's the way I've tried to bring up my daughter and how I'm going to bring up my son. 'You're going to be out there with me'."
> —Naknek drift fisherman, 26 February 2015

8.3. Work Ethic

One of the common traits possessed by fishermen in this study is their desire to do hard work, or at the very least their willingness to tolerate it. Many fishermen also questioned the strength of the work ethic possessed by local kids in the region. Showing up at the harbor on time, waking up for a commercial fishing opener and fishing until it ends, doing preseason prep work in the boat yard, and staying through the season until fishing is over are all examples of the ways a strong work ethic must be engaged in order to be a successful fisherman, whether that means being a deckhand or a captain. Many captains lamented the difficulty in hiring crewmembers that possess those traits, and often contrasted the situation they find themselves in now with their experience working hard as a deckhand and never dreaming of quitting before the season ended.

8.4. Determination

Fishermen generally agreed that entry into the commercial fishing industry as a permit holder is financially difficult; however, most expressed the belief that if a young person has the determination and drive to pursue a fishing career, they could absolutely do it. They framed having the desire to fish as the most basic component of entry into fishery. Without that all-encompassing desire, the obstacles to ownership are unlikely to be overcome.

8.5. Youth Interest

The burning question with respect to motivation is: do kids today want to fish? The answer seems to be yes and no—some do and some don't. This certainly isn't a novel finding; however, what may be changing is the balance of interested to uninterested kids. Fishermen described knowing from a very young age that they loved

fishing and looked forward to fishing season every year, they also described siblings or cousins they fished with as kids who were ambivalent toward or generally hated the experience. Are changing values among youth responsible for a rise in the proportion of kids who don't care for fishing? Examples given in this study include kids' attachment to their devices (there's no internet at fish camp), their near constant engagement with social media, and changes in which pop culture heroes that kids idolize. A veteran fisherman contrasted the experience kids have today with his own in the 1960s:

> "I see a big shift. When we were growing up and we were kids, actually the role models were the highline fishermen. They were like our sports heroes—to the generation today. That's all we wanted to do was go out on a boat and be like them…I don't see that there anymore."
> —Dillingham drift fisherman, 22 September 2015

Another big shift, which may or may not be related to the uncertainty bred by the disaster years, is that increasing numbers of kids leave the region to attend college. The emphasis on higher education has become more pronounced in recent decades, not only in Bristol Bay but across the nation. Fisherman parents who have struggled through the lean times may be especially prone to insist that their children get a college education to have something on which to fall back if they do indeed enter commercial fishing. However, the trend seems to be that youth earn a degree outside of the region that young people have tremendous difficulty in bringing back to their home community, making it challenging to find meaningful work.

9. Crew/Roles

9.1. Finding Good Crew

Both new and veteran captains expressed frustration with the availability of good deckhands. The qualities they associated with a good crewmember included obedience, reliability, and hard-working, in addition to being a fast fish picker and a quick learner. Many attributed the challenges they have had with hired crew to the lack of those essential qualities, though other difficulties are borne of the power differential inherent in a captain-crewman relationship (discussed below). Captains distinguished between the potential costs and benefits of hiring local versus non-local crews; for instance, local deckhands are likely to be available for preseason prep work but may also be more prone to quitting early when the fishing isn't good anymore (i.e., they aren't making as much money). Non-local crewmembers, according to veteran captains, are sometimes more likely to stick through difficult periods during the season, but are sometimes extremely ill-prepared for the rigors of the short, intense Bristol Bay fishing season, having been motivated to seek a deckhand job by a friend's stories or reality TV shows.

9.2. Being the Boss

The captain-deckhand relationship can be difficult to navigate for some new captains, for many reasons. Certainly for a young captain, there is the very real possibility that a hired deckhand may be older with much more fishing experience than they possess. The dynamic is further complicated, according to a few captains, with mixed-gender crews. This may not be an issue on boats or set net sites where a majority of the crew is made up of family members, but for hired crewmen on a drift vessel, managing a female deckhand as a male captain or vice-versa can present unexpected challenges. For example, a young but experienced drift captain explained that he doesn't hire female crew anymore not because they can't do the work, but because he felt extremely uncomfortable yelling orders to a woman in a way that he didn't with the men on his crew. Other complicating factors in the captain-crew

relationship include expectations around sobriety on the boat, the captain's style of crew management (e.g., some captains get branded as "screamers"), and the nature of that relationship outside the context of fishing (e.g., husband-wife operations, friends, mentor-protégé, strangers).

9.3. From the Back Deck to the Wheelhouse

Characterizing how deckhands work their way up to ownership-level fishing careers is an important goal of this study. The path to ownership paved by hard work, years of experience, and saving wages earned as a deckhand is becoming increasingly narrower as the costs of investing in a fishing operation skyrocket and the number of fishing rights locally available to fishermen shrinks. Captains and crewmembers both agree that even at high crew share percentages (e.g., 15%), saving up to invest in a permit, vessel, and gear is extremely challenging. In addition, it has become harder—though still very possible—for a young Bristol Bay resident to find a crew job and gain the experience necessary to one day run their own boat, given that a majority of permits are held by non-locals who typically bring in their own crews.

Another interesting phenomenon revealed by the data is that of deckhands that never move into the captain's chair. Many people, whether by choice or by circumstance, find themselves in the position of being a "career deckhand". In some cases, a crew share is stretched to support a family, and may or may not be combined with outside employment to make ends meet. The reasons for becoming a career deckhand are not entirely clear and are likely products of each individual's life experiences and personal preferences. That's not to say, however, that the financial challenges presented by the limited entry permit system have nothing to do with this trend.

9.4. Family as Crew

There are numerous combinations of family members working as crew within one or multiple operations. These arrangements vary somewhat between communities and by gear type, with villages and setnetters tending toward crews made up of extended family, and hubs and drifters employing both but tending toward nuclear family operations and hired crew. Family 'cooperatives'[8] employ family and non-family crewmembers, but under this kind of arrangement crew are sometimes paid by the day or the hour, rather than a share of the overall net or gross revenue. Having family as crew can be both a blessing and a curse—it can be a wonderful opportunity to share in an important family and cultural tradition, and it can also sour relationships or make for a bad fishing experience.

> Interviewer: Are there many non-local boats that come in here?
>
> Fisherman: There's—during scrap season they do, but mainly they try and fish here and that's how it—I've only hired two from here, as opposed to my family. My family had to get out of jail. [laughs] 'What?!' And then my nephew calls me, 'can I come fish for you?' And then I have two guys come from—two of my nephews come down here before, but my sister needed help up in Akiachak, so they came here, they actually got my boat—helped me get my boat ready and they were…his dad got hurt. So I have to send them back.
> —Togiak drift fisherman, 3 October 2014

9.5. Treatment of Crew

The vast majority of crewmembers earn a predetermined percentage of the vessel's gross or net revenue—that is, earnings before and after costs are deducted, respectively. Though this arrangement is based on a long-

[8] See Section 2.3 Family: Families Fish Together

standing tradition and seems relatively straight-forward, there are great disparities in how crew members are paid and whether such practices are perceived as fair by the captain and crew. A significant concern for deckhands in this fishery is that they essentially have no recourse if their captain treats them poorly throughout or decides to stiff them at the end of the season. The experience of a deckhand from Togiak perfectly exemplifies this issue; the deckhand agreed to work for a captain early in the season, without explicitly discussing what his crew percentage would be (as is probably quite typical; it is likely considered to be a bit forward for local folks to directly ask what they will be paid). In the end, the captain gave him a check for much, much less than the percentage he was expecting, and a welder—which he was clearly not expecting, but accepted anyway since it was better than nothing. A few crewmembers said that they'd like to see crew contracts become more normal, in order to protect both the deckhand and the captain in the event that either party doesn't meet the expectations each agreed to.

> Interviewer: What's average percentage paid to crew here, do you think?
>
> Interviewee: If you're a greenhorn five to seven percent. Or less. If you're a lifelong crewmember with a captain, it goes up to twenty-five to thirty-three percent.
> —Togiak fisherman, 4 October 2014

9.6. Qualities of Good Captains

What types of roles do fishing captains play on a commercial fishing vessel or site? In most cases, the roles of captain and crew seem to exemplify an employer-employee relationship, but from that is often built the kind of relationship that encompasses teaching, mentorship, caring, and lasting emotional bonds. Our data suggest that certain qualities are important for crew to look for in a captain, such as patience, respect, honesty, and a strong work ethic. Some crewmembers would prefer to do all the technical work, like boat maintenance, gear hanging, and picking fish, without ever having the experience of setting a net or navigating a sandbar-channel-sandbar combo in an outgoing tide. Others, however, place a great deal of importance on finding a captain that will provide them with some sort of informal mentorship with which they can acquire the skills and knowledge necessary to one day run their own fishing operation[9]. In some instances of drift fishing where this mentorship occurs, as well in other arrangements between captain and crew (e.g., fishing partners), a level of trust is achieved between the two such that a captain may purchase a second fishing permit and put it in their crewmember or fishing partner's name. Legally, that crewmember could walk away from the operation and start their own with that gifted permit, but generally the social capital that has been established reasonably assures the captain that the crewmember won't leave them in the lurch. This scenario is an example of one of the ways that captains who play an informal mentorship role in the lives of young, determined crewmembers may facilitate entry of the latter into ownership-level fishing careers.

10. Knowledge/Skills

10.1. Sources of Fishing Knowledge

Knowledge of how to fish, how to prepare for fishing, and how to maintain a fishing operation over the long-term is acquired through multiple channels. The foremost source of knowledge for local Bristol Bay fishermen is family. As unsurprising as this finding is, it reaffirms our other results that indicate just how important family connections are in sustaining participation in the commercial fishing industry. New and veteran fishermen described,

[9] See Section 10 Knowledge/Skills

for example, learning outboard repair from their grandfather, or how to manage the financial aspects of their business from their auntie. Perhaps an understanding of how to hire and manage crew came from their own experience early on as a permit holder when working with siblings or cousins as deckhands. Transference of these kinds of knowledge do not require a blood relation, however; certainly a young fisherman that doesn't come from a long line of family fishermen may get on with and learn valuable skills from an unrelated captain or deckhand.

10.2. Types of Knowledge and Skills

Throughout this study, I have gotten mixed messages as to how difficult it is to learn to fish. Some interviewees explained fishing as a very simple, intuitive process involving finding fish, driving a boat, and staying awake for long periods at a time. Others were a bit more nuanced in their explanations, suggesting that the reason people seem to think fishing is intuitive is that they have possess the knowledge base that allows them to act without really thinking about why or how something was done. The categories of knowledge that are relevant to this code include the 1) act of fishing, 2) business and financial management and 3) ecological and environmental.

10.3. The Act of Fishing

This type of knowledge includes how to set a fishing net, line up with other boats, pick and deliver fish, and when to stop fishing. It can also include knowledge of the regulations pertaining to one's fishery and district, for example, knowing where the district boundaries are, how to transfer from one district to another, or how to pay annual permit fees.

10.4. Business & Financial Management

Learning best financial practices and how to make prudent business decisions is easily the most challenging skillset that many permit holders must acquire. This kind of knowledge is not typically taught in schools, and older generations of fishermen may or may not have ever adopted a business-like approach to their fishing operation. Those who did may not have explicitly taught their children or aspiring captains the ins and outs of running a fishing operation with respect to things like applying for and servicing loans, paying taxes, putting money into escrow funds for tax-free vessel improvement purposes later, hiring and managing crew, and so on. Of course, there are things that a person must learn experientially, but by and large, this type of knowledge seems to be most problematic for new permit holders.

10.5. Environmental & Ecological

Another knowledge base acquired over the course of years and spent on the sea is that of learning to read weather, the contours of the Bay, how fish move, and the behavior of region's notoriously high tides. Many veteran fishermen commented on the safety improvements that came to the commercial fishery after the ban on power boats was lifted in the 1950s. In the previous era, sailboats were subject to storms moving up along the Alaska Peninsula and fishermen were unable to make it back to shore safely, often stranding or capsizing in futile attempts to do so. In addition to knowing how to read weather for safety purposes, reading weather and watching tidal patterns gives fishermen clues as to the behavior of the fish they're trying to catch. On longer time scales, fishermen observe shifts in the morphology of the Bay or their fishing sites, and in the movement and arrival timing of sockeye schools. This type of knowledge is critical for not only adapting one's practice of fishing, but for understanding ecological change on a broad spatiotemporal scales.

10.6. Mechanical

Possessing knowledge of a vessel's mechanical systems is just shy of mandatory for a commercial fisherman. One could ostensibly hire a mechanic to do work on an engine, hire a welder to repair hull damage on their aluminum skiff. However, the majority of fishermen in this study emphasized the importance of knowing how to fix things that inevitably break on a vessel while on the water. Having to take a boat out of the water, get in line to see a mechanic for a diagnosis, wait for parts to be shipped and work to be completed, costs a fisherman at a minimum several days of fishing time.

10.7. Chicken-Egg Problem of Fishing Experience

Entry-level deckhands need some basic level of experience to get a job as a deckhand, but working as a deckhand is typically where people learn those skills. Some captains recognize that not taking on greenhorns is a recipe for disaster in terms of finding good crewmembers in the future. Others solemnly swear they have no patience for someone who doesn't know what they're doing. It seems, though, that there is some sense of responsibility among captains to take on the challenge of making fishermen out of teenagers that jump on a boat for a summer paycheck. Similarly, young residents of upriver villages like New Stuyahok and Kokhanok face additional challenges in getting into fishing as a greenhorn, but in a slightly different respect: they may not realize that getting on a boat is something they can do, unless they have been exposed to the commercial fishery through family or local permit holders from their village. Communities with few permit holders necessarily require few crewmembers, and those positions are not likely to be filled by people unrelated to the captain. A question that remains—or rather, was spurred by the findings of this study—is: how has the drain of permits from upriver villages affected young people's exposure to commercial fishing in those communities?

11. Generation

"Generation" was used as an attribute to describe instances of change over time; for example, if an interviewee talked about how the cost to buy into the fishery had tripled since they began fishing, that might be coded as "generation", "financial", and "barriers". Examples of change through time have been covered in depth elsewhere in these memos, but key examples of change will be described below. "Generation" was also used to understand differences between today's generation of young residents in Bristol Bay and previous generations.

11.1. Major Changes

11.1.1. In the Fishery

Buying into the fishery in the 1970s and early 1980s was much more affordable and provided a much higher return on investment than the fisheries today. The subtext there is of course that before and even in the early years of limited entry, the value of Bristol Bay fishing rights hadn't at that point been fully realized, but certainly has since then. Veteran fishermen also talked about the simplicity of getting experience in the fishery back then, which involved little more than expressing a vague interest in trying it and letting word of mouth take care of the rest. They also described a shift away from nuclear family drift operations, and to some extent family-based set net operations (i.e., being replaced in some cases by cooperatives[10]). One fisherman in particular recalled the fishery being much

[10] See Section 2.3 Family: Families Fish Together

more cooperative in the mid-1970s, calling it a relatively nice fishery, full of "Natives and [Seventh-Day] Adventists". Today, the fishery has become much more competitive, and, from the perspective of some, "cutthroat"—though this quality is largely attributed to the presence of outside fishermen.

Another point to be made about generational changes in the fishery relates to the period in the early 2000s. Fish prices bottomed out and many permits were sold or sat idle, and this event had a significant impact on people's perception of the fishery. This certainly wasn't the first time that the fisheries had struggled with economic viability, but it was the first and most impactful period of financial disaster since limited entry—which was designed to avoid economic hardship among the fleet—was implemented. Further, it was probably the first time in the memories of all but the eldest fishermen of such a protracted stretch of "lean years". This shift, even though fish prices eventually recovered, has no doubt affected the way that people thought about and participated in the fisheries. Those that were just old enough to understand what was going on then are now in a position to reconcile their perceptions of that time with their decision to enter or not enter the commercial fishing industry.

Many veteran fishermen observed that the length of the fishing season and the number of fisheries that were available to them (e.g., kings in June, silvers in August and September) have diminished greatly over time. Some attribute this contraction of fishing time and opportunities to salmon processors, which operate and buy fish during the summer for only as many days as it is profitable to do so, and to changing management regimes. In the case of the latter, there doesn't seem to be a direct link between some change in the regulations and the elimination of other fishing opportunities in the bay, but rather a general decrease in the available harvest of king salmon in the Bay or a lack of interested fishermen in the case of late-season silver salmon.

> "The seasons aren't there. The seasons just don't exist anymore. Particularly the king season. I mean, we used to get five days a week. You get your boat broken in, you get crew broken in if you've got them there. But those seasons too are what you can do by yourself a lot. So you can just be drifting and nobody fishes by themselves anymore."
> —Dillingham drift fisherman, 5 October 2014

11.1.2. In the Community

During the early and middle 20th century, Dillingham grew as a government town. Naknek has long been a fishing town, but has become more industrial with respect to commercial fishing. The takeaway here is that it isn't just fishing that has changed, but the entire way of living (though less so than in other places in Alaska). Semi-nomadic subsistence living was the norm up until as recently as the 1950s, but when technology, infrastructure, and connectivity to the rest of the state and nation boomed during the oil era, those practices diminished. Cash was infused into the local economy, and so a source of income became critical in order to participate as a local resident. Commercial fishing was an accessible occupation for many local people (that is, after canneries shifted away from their discriminatory hiring practices), but other occupations in the marine services and public sectors also provided people with cash incomes. Hunting, fishing, trapping, gathering, and sharing still occur to a large extent in the Bay, but the role of and motivations for fishing have clearly changed over time.

> "The good years were the territorial years when we were really poor but we didn't know we were poor…We lived completely on subsistence, we didn't drive cars…if we wanted to go anywhere…our main transportation was dog team in the winter, and the boat in the summer and catching fish on the beach."
> —Naknek set net fisherman, 25 September 2015

11.2. Youth Work Ethic

Though it has become a trope associated with curmudgeonly old-timers, the opinion that "kids today are lazy" was expressed in this study, though in a somewhat less rhetorical way. People who held that opinion tended to explain rather eloquently their reasons for doing so, and compared their upbringings with those of today's youth. A community leader and long-time commercial fisherman in Togiak contrasted the work ethic of kids in his village with the narrative of his childhood growing up in the Interior, and his chores catching fish and feeding sled dogs beginning at age seven. His point was that it was normal then for kids to be expected to work—and work hard—at a young age, and that that's no longer true. To be clear, most people referred to hard, physical work when commenting on the laziness of young people—not in terms of academic or other pursuits.

> Interviewer: What about young people from here? Like are there many young people from here that are getting—
>
> Fisherman: That go down [to Naknek to fish]? I want to say there's a few, but I want to say kids are kind of worthless nowadays. They don't work as hard as they used to.
>
> Interviewer: Do you really think there's like a work ethic—
>
> Fisherman: I do.
>
> Interviewer: —dimension?
>
> Fisherman: I remember working a lot harder than they did.
> —Kokhanok set net fisherman, 24 February 2015

11.3. Generations of Family

It is quite common for permits to move from one familial generation to the next. Many people inherited or purchased their permit from an elder family member, and those permits may have changed hands laterally within generations multiple times. Most frequently, young captains learned to fish with and were transferred a permit from their parents or grandparents. In families with many permits, any extended family member may transfer a fishing permit. Bristol Bay fishing families are networks—sometimes quite dense networks—of people and time between which knowledge, cash, tradition, fishing roles, and fishing rights are constantly (on multi-generational time scales, anyway) reorganized.

12. Local/Non-local

12.1. Identity

Who is "from" Bristol Bay? This is a question I have debated internally throughout the course of this study. What it means to be of and from a place is highly nuanced and specific. Our questions were not design to understand those nuances, but it's possible to glean some understanding of local/non-local identity from the way that people talked about different groups of people in the interviews. Certainly, those who were born, raised, and continue to live in Bristol Bay are locals. Then there are those who were born and raised in the Bay, have moved away from the region, possibly to Anchorage, and return seasonally to fish. They might be considered local, but perhaps a different kind of local. Many of the permit holders and fishermen that fish Bristol Bay have never lived year-round in any of its communities, but their families have migrated there and fished seasonally for multiple generations. How this group figures into the local/non-local schema remains somewhat of a mystery. Even though residents of Seattle who

have been fishing for generations in Bristol Bay might be accepted as individuals by locals, as a group, non-residents are easier to condemn.

The ambiguity in who is local and non-local is as much how people are perceived by others, and how people perceive themselves. A Bristol Bay fisherman who grew up in Naknek expressed her feelings about where she chooses to live, and the internal struggle with that choice, in this way:

> "I think about [moving back] all the time, and I miss home so much I really would love to be able to move back up to Alaska. But with the cost of living and everything, I just [don't] know…I think about that every single day. I haven't found somewhere in Alaska yet where I think I could live year round, just because I deal with Seasonal Affective Disorder, and the daylight is really hard for me. I get really depressed in the winter there. I love the Olympic Peninsula. I can see myself staying right where I am in Port Angeles for the rest of my life, and being totally happy with that. So, I'm torn. I'm approaching the point where I've lived in Washington almost as long as I've lived in Alaska. Well—I guess not—I lived there for 18 years and I've only been here 12. But that's gonna be hard for me, when I'm a Washingtonian and not an Alaskan anymore."
> —Naknek set net fisherman, 21 April 2015

12.2. Outsiders in Fisheries and Communities

Outside fishermen are both tolerated and excoriated by local fishermen, for several reasons. For one thing, they've always been a part of the fisheries in Bristol Bay. It doesn't appear though that they have been fully integrated into the fisheries and communities; fishermen described negative interactions with outside fishermen on the water, in which their overly aggressive fishing style impacts—sometimes literally—the fishing operations of locals. To be sure, outside fishermen aren't the only aggressive fishermen that get into scraps with other boats. Though conflict between locals and non-locals arises on the water, interviewees revealed that a great deal more conflict occurs on land. Each summer, the Bay's coastal communities are inundated with outsiders, and the mixing of the two groups—especially after a night at one of the local bars—can sometimes result in drinking, fighting, catcalling, littering, vandalism, and generally disrespectful behavior. A common example of what is considered disrespectful by locals is a non-local trying to make small talk by asking "how can you live here? I just couldn't do it." Locals internalize this sentiment as a negative perception and offensive characterization of their community.

> "But then you know I hear some people talking, 'well, this is the only thing I feed my family with,' which is—it's a crock. It is because they don't spend no money in our community, they disrespect this community to the fullest, throw garbage all over. Break glass all over. Not all but, a majority of them. To me that's not right. I wouldn't go do that in their city or in their town…And the stuff they pull up here, they'd probably be shot down there—back home. So why come up here and try to pull what they are? Because it gets real bad…And it's just all attitude. They're just—like animals when they come up here. Totally different. Yeah, but that's where that's at."
> —Naknek drift fisherman, 1 March 2015

Because this study didn't include outside fishermen as part of its sample, it is impossible to accurately characterize their perceptions of local/non-local relationships. The only source of information I have available is the testimony of non-local fishermen addressing Board of Fisheries proposals. The tension between Bay residents, residents of other parts of Alaska, and non-residents becomes quite apparent in proposals and when they are discussed at Board meetings. Generally speaking, outsiders see themselves as just as much a part of the Bristol Bay commercial fisheries as year-round residents of the Bay, and in some cases, believe that certain regulations (i.e., set net permit stacking when it was legal) place non-locals at a disadvantage in their fishery.

Fisherman: [Non-locals are] not interested in having them being little terminal fisheries at the mouths of rivers. They want to just go out with big boats and, you know…and that's all aimed at catching more fish. Not necessarily being more manageable or being good for the local fishermen. The guys that are putting these proposals in are guys that are…

Interviewer: Non-residents? (laughing)

Fisherman: They're not the little, community fishermen.

Interviewer: Oh, right.

Fisherman: Some of them are residents of the state. But they're not—most of them are Washington residents. Some of them live in Anchorage. And I don't really know their economics, but it's not the same. They're not living in a little village paying $8 a gallon for gas, catching 40 to 60,000 pounds and barely scraping by. It's a different breed of fishermen.

Interviewer: Yeah. I'm trying to think of the word…like a different type of fishermen.

Fisherman: Yeah. And that's what the industry will go to if the price doesn't come up.

12.3. Local Youth and Entry

Fishermen expressed a desire to see local youth specifically get into and succeed at fishing, but were doubtful that they are getting opportunities to do so, in light of permit and resident outmigration trends over the last few decades. A long-time fisherman surprised me by framing the graying of the fleet issue squarely in terms of residency:

> "I don't think there's a problem getting younger people in the fishery, it's just where those younger people call home…definitely a problem with watershed residents getting into the fishery. I think there's just inherent barriers if you live here. High cost of living, lack of other employment opportunities—especially if you get out of Dillingham, King Salmon area to the more outlying villages. So those two things, I think—yeah. And if you look at it there's no question that the younger people for whatever reason—they don't have the interest."
> —Dillingham drift fisherman, 22 September 2015

This appears to be an important distinction: the magnitude of the financial investment required to enter commercial fishing is a significant barrier for nearly all young people, regardless of geography. However, the costs are disproportionately more challenging for young Bristol Bay residents to overcome given the two factors that are highlighted in the quote above. First, local youth that stay on in the communities after high school are likely to experience much higher costs of living than their non-local counterparts, meaning they are likely saving less money to be put toward a down payment on a permit loan. Second, the employment opportunities for young people in the region are more scarce than they are in urban areas of Alaska or elsewhere in the Lower 48 Without a steady source of income, saving for or making payments on a permit loan is a virtual impossibility.

Finally, it is worth mentioning the sentiment that often came in response to our final interview question: "is there anything you'd like to add about the next generation of fishermen in Bristol Bay?" The answer was often something to the effect of "I'd like to see them." This may not seem like a revelatory statement, but it indicates that there is a real concern and genuine desire for the commercial fishing industry to be sustained by young Bristol Bay residents.

12.4. Keeping Permits Local

A major concern in the Bay is the outmigration of fishing rights, whether by transfer of a permit from a local to a non-local or relocation of a formerly local permit holder to a non-local area [11]. The permit outmigration trend began shortly after limited entry permits were initially allocated in 1975. Since then, around this issue has formed a sort of ethical code about selling permits, and selling them to non-locals under the table.

> "People—even people that where you would think they would have some kind of social conscience about this. They went and sold their permit. I had this conversation with this one guy that—'what? You sold it to'—I'm not going to say the name of the guy. 'You sold it to him? You live in this town, why didn't you sell it to a local person?' To me, that's unexcuseable [sic]."
> —Dillingham set net fisherman, 24 September 2015

Clearly, the stigma attached to selling a permit out of region is substantial. It follows, then, that people who are in a position to try and maximize their profit on the sale of a permit might feel like they must sell to whoever can pay the most, regardless of their home address. If that's the reality, the seller likely wouldn't be sharing that information with other people in their community.

13. Support

The code 'support' encompasses multiple facets of life in a Bristol Bay fishing community, including encouragement and discouragement for getting into commercial fishing, pursuing a post-secondary education or career outside of fishing, financial and knowledge/training support, and infrastructural or cultural support of fishing within communities and the region.

13.1. Encouragement and Discouragement

13.1.1. Commercial Fishing Careers

Fishermen's personal experiences varied as to whether their parents encouraged or discouraged them with respect to pursuing commercial fishing as a livelihood, or offered no opinion on the matter. Reasons for encouraging young people to pursue fishing careers today include the ability to live in the Bristol Bay region and enjoy the benefits of life in a small, rural community (e.g., safety, quiet, subsistence lifestyle), the ability to be one's own boss, and to work hard and make an honest living. In recent years, and especially after the disaster years, reasons for not pursuing a fishing career have mounted. The uncertainty in fishing incomes and associated financial instability, the risk to life and limb, the back-breaking nature of fishing work, the availability of easier and better-paying jobs, and the desire for their children to see and experience places outside of Bristol Bay are all reasons why a parent might discourage their child from entering the fisheries. A young captain recalled the message relayed to her when she was considering following in her parents' footsteps:

> "My dad said straight-up, multiple times, 'you can't really make a living fishing, don't count on making a living fishing, there's other things you could do'."
>
> —Dillingham drift fisherman, 1 October 2014

[11] See Section 6.2 Permit Dynamics: Outmigration of Fishing Rights

13.1.2. College and Going Outside

Though it may not be a new or regionally unique effort, pushing kids towards college has certainly had an effect on fisheries participation by the younger generation. The desire to see one's kids pursue a college education is a shared cultural value that is embodied by the American dream of upward social mobility through hard work. Parents—even those who fish themselves—often want their kids to have a better, more financially rewarding life than they had. Many parents don't see fishing as a profession that can afford kids that opportunity. However, some young captains (i.e., in their mid-twenties to mid-thirties) described parental ambivalence about their pursuits after high school. Some of them went to college anyway, came back, and bought into the fishery. On an individual basis, a parent's pushiness about college may or may not affect a kid's decision to eventually become a fisherman, but it does seem like on a regional level, the trend of pushing kids to go to college has resulted in a drain of young, motivated, and capable people from Bristol Bay's communities.

> "Well, [there is] a brain drain on the region; it happens and it's happening because, you know, people are encouraged to go and get an education. I wanted to be a physical therapist at one point and I was getting my Bachelor of Science Degree, and about halfway through the degree, I kind of realized that, if I got this degree, it would probably require me to live somewhere else in order to make a living and that didn't make a whole lot of sense to me. You live somewhere to make a living and don't enjoy where you live or you move to somewhere where you enjoy and you figure out how to make a living, I guess, so that's what I've done. So where you're at is more important than what you have maybe, I don't know."
> —Kokhanok fisherman, 25 February 2015

To a lesser extent, parents encourage their kids to simply experience a different place and a different way of living than that of rural Alaska. This too can have the effect of kids finding a place that suits them and putting down roots outside of the Bristol Bay region, which removes them from the pool of locally raised people available to participate in commercial fishing. Many people do return, however, and some of the young fishermen claimed that it was going "outside" that gave them some perspective on the unique opportunities that one has access to by living in Bristol Bay.

> "I think they want us to move away [from Naknek], 'cause … when you're young, see the world a little bit, and not just be so constrained to one view of life. Because it's like a little time bubble out here. Nothing ever changes."
> —Naknek drift fisherman, 7 July 2014

13.2. Individual Support

Support for individuals to participate in commercial fisheries abound in nearly all Bristol Bay communities; the exception being those that lie more than 50 miles from the Bay's coast and thus outside of the CDQ boundary. The Bristol Bay Economic Development Corporation and its permit loan, vessel acquisition/upgrade, financial counseling, job placement, permit brokerage, fish tote, and ice barge programs are all designed to support the success of fishermen as individuals and as a critical part of the fishing industry[12]. The resources are available to people, but there remains somewhat of a disconnect between these opportunities and the residents who are eligible for them.

[12] See Section 16 Community Development Quota Program

Families are also a key source of support for individuals engaged in the fisheries. Without the financial resources, knowledge, skills, experience, and access to fishing rights provided by family members, many local fishermen would be at an even greater disadvantage than they are at present in obtaining ownership-level fishing careers. Processing companies often support their fleet financially, especially in the form of preseason loans, shipping of goods on company barges, and a secure market. As the saying goes, no man is an island, and perhaps even more fitting is a different take on the old adage: it takes a village to make a fisherman.

Lastly, and to state the obvious, fishermen are people. What I mean by this is that our study has illuminated the fact that Bristol Bay fishermen fish for somewhere in the neighborhood of six weeks out of the year, and outside of that, they resume more or less civilian status. The functioning of the whole person is part of what makes it possible for residents of Bristol Bay to engage in the fisheries in a productive manner. Several instances of legal trouble (e.g., a stint in jail, non-payment of child support or taxes), substance abuse, mental and physical health issues, and domestic struggles (e.g., finding childcare, caring for elders) surfaced through the interviews, suggesting that these are serious impediments to participation in fishing that are not as yet fully understood.

13.3. Community Support of Fisheries

The level of community and institutional support to help individuals participate in the fishery is incredibly important in sustaining local engagement and fishing culture in the region. For instance, qualitative differences emerged from the interviews and my time spent in the hubs of Dillingham and the Bristol Bay Borough in the level of infrastructure, institutional support, and access to educational resources possessed by each community. Naknek has the facilities that are typical of a fishing port, including a fish grinder, freight dock and crane, industrial ice machine, seemingly endless boat storage, and dozens of processing plants and associated warehouses, machine shops, and supply stores. Dillingham, on the other hand, has a city-owned harbor, an ice machine, two fully operational processing plants and two boat yards. The infrastructure differences don't necessarily diminish or affirm either city's position as a fishing town, but the availability of services and amenities provided by the municipal (Dillingham) or borough (Naknek, South Naknek, and King Salmon) government is key to a functioning commercial fishing industry. Many fishermen provided suggestions as to what sorts of infrastructure improvements would further support engagement with commercial fisheries in their communities.

> Interviewer: Are there support services available in Togiak? Like, are there diesel mechanics around and—I don't know if refrigeration is on a lot of boats here—but people that can work—
>
> Fisherman: That was another idea. You know, if I was sitting in the [tribal] council again, before changeover, we were talking about getting a good-sized building [and putting] welders in there. Put mechanics in there. Do our own thing instead of going over to Nushagak or Dillingham for those services.
> —Togiak drift fisherman, 6 May 2015

Differences in institutional support of fisheries are apparent between the hubs as well. The Bristol Bay Campus of the University of Alaska Fairbanks (which houses the Marine Advisory Program), BBEDC's main office, the Bristol Bay Native Association, the local Curyung Tribal Council, and the University of Washington's Alaska Salmon Program—which conducts long-term biological studies of the salmon resource and annual run forecasting—are all located in or near Dillingham. The Bristol Bay Borough, on the other hand, is home to the Southwestern Alaska Vocational and Education Center (SAVEC), and the local tribal council and corporation,

Naknek Native Village Council and Paugvik, respectively. These entities are all critical pieces of the region's fishing culture, and each hub and surrounding villages have access to the other's offerings. However, the strength of these institutions' influence on fisheries participation does seem to be quite geographically concentrated.

14. Access

This term has been used frequently throughout the course of this study, and so it seems appropriate to define it here. Access to commercial fisheries is the ability of people—specifically local residents in our case—to obtain employment (e.g., as crew or captain) in the harvesting sector of a fishery. Access is influenced by economic, social, geographic, legal/political/regulatory, and demographic factors that vary among communities, fisheries, and individuals.

14.1. Barriers to Entry

Things that obstruct or challenge access to commercial fisheries include the high cost of entry in tandem with access to capital, privatization of fishing rights, a monopsonistic (e.g., few buyers and many sellers) market/processing sector control, lack of fishing knowledge and experience, and exposure to commercial fishing, especially in villages that have experienced severe permit outmigration. These access barriers will be discussed in more detail below or in other memos.

14.2. Exposure

I have been using the term "exposure" to illustrate the idea that some young people have little awareness of what the commercial fishing industry, identity, and culture is about because they come from places or grow up in circumstances with so few people around them actively engaged in the fishery. Fishing is gone in some villages, and was never really a part of life for some families across the Bay (e.g., those who move to the region for a job outside the fishing industry).

> "I think a lot of youth would like to go fishing, they'd like to be a part of it, but I see there being less opportunity, definitely less opportunity than when I was younger just because your permit holders aren't there in the village, a lot of people have sold out."
> —Kokhanok fisherman, 25 February 2015

14.3. Limited Entry

The privatization of fishing rights in Bristol Bay constitutes a turning point for access to commercial fisheries by locals. To be clear, few fishermen spoke directly of the link between the Limited Entry Permit Program instituted in the 1970s and the challenges that people face in accessing commercial fisheries today, but the byproducts of privatization (e.g., high cost of fishing rights, permit outmigration) were evident in the data. The program was designed specifically to limit access to the fisheries, so it is no surprise that it has succeeded in doing so over the past 40 years. What wasn't clear then, and is painfully obvious now, is how the limitation of access would target and disproportionately burden local residents of Bristol Bay communities.

> "When I got in there wasn't limited entry then. But then the limited entry program came along and I did get in. And most people did. But then there were some glitches to the whole system. And then, what do you call it? The whole… economics of that permit—that you have access to the fishery then turns into this like piece of property. Well, I guess they don't call it a piece of property, but the value just escalates so much because of the dynamics of the fishery that a lot of the young people can't get in unless they inherit."
> —Naknek drift fisherman, 26 September 2015

The "glitches" in the system that are referenced above were the criteria for initial allocation of fishing permits and the on-the-ground approach to implementation of the Limited Entry Permit Program in the region. Briefly, the criteria to qualify for issuance of a limited entry permit were economic dependence on the fishery and fishing history. However, difficulty in navigating bureaucratic processes, language barriers, challenges in producing tax records (i.e., proof of economic dependence), and a fundamental difference between the way local people fished in those days compared to the model of fishing behavior from which the criteria were presumably designed all contributed to the disparity between people who did fish and did depend on commercial fishing income but for whatever reason did not qualify or apply, and those who were allocated permits at the outset. For example, drift fishermen routinely partnered on a single vessel, but only one partner would deliver fish under a that gear license. The other partner could not use that fishing history to qualify for limited entry because the gear license was not in their name. Further, commercial fishing was a more opportunistic practice among local fishermen prior to limited entry than it was assumed to be by the designers of limited entry. People routinely fished the peak of the season, roughly two weeks, then pursued other subsistence opportunities like fishing upriver, hunting, or gathering berries.

14.4. Access to Services

Being able to acquire knowledge and skills through training and education programs is crucial to building a successful fishing career. For people whose families do not fish, or whose family members cannot feasibly pass on knowledge and skills (e.g., grandfather has health conditions that make it difficult to spend time teaching outboard repair), these programs serve as an important conduit for fishing related knowledge. In addition to education, other services that fishermen need access to include mechanical repair, fiberglass work/welding, refrigeration systems repair, fish tendering, tax/financial help, retirement advising, and so on.

14.5. Subsistence fishing as pathway to commercial fishing

> Fisherman: And my world came to on a boat (makes explosion noise) 'Wow, where am I?!' That's how I remember the world. Being in a blue bucket.
>
> Interviewer: Wait, you were born on a boat—is that what you're saying?
>
> Fisherman: No, when I first got my conscience, 'wow, there's a moon, there's a sun—my world came to me in a boat.
>
> —Togiak drift fisherman, 3 Oct 2014

Subsistence and commercial fishing evolved from the same foundation made of human-salmon relationships in Bristol Bay. Subsistence ways of life are still very common among Bristol Bay families, and provide nutritional, social, cultural, and spiritual nourishment. Many studies have linked subsistence and commercial fishing together, primarily focusing on economic dimensions of mutuality. For instance, cash income from commercial fishing supports the purchase of boat gas, food, and equipment for subsistence fishing (whether that means going to fish camp for two weeks or retaining "homepack" catches on commercial drift vessels). However, there subsistence can support the sustainability of commercial fishing livelihoods by providing young fishermen with exposure to the skills, knowledge, ethics, and practices of fishing long before stepping foot on a commercial skiff or gillnetter. Further, participating in subsistence fishing and sharing food, knowledge, and skills is reinforcing of the culture and identity that unifies commercial fishing individuals, families, and communities. However, in the context of the

immense loss of locally held fishing rights, it must not be assumed that subsistence alone will support these cultures and identities; each practice supports the other.

14.6. Setnetting to Drifting

Because the cost of entry is so high for drifting, it occurred to me throughout the course of this work that, logically, a less expensive fishery like setnetting should be a stepping stone to a higher-cost, higher-gross fishery. However, when asked, fishermen pointed out that drifting and setnetting are functionally very different styles of fishing, and that people with different family circumstances tend to gravitate towards one or the other, with few crossing over during their careers. Setnetting has traditionally been a family fishing experience, mirroring that of summer subsistence fish camps, but for commercial production rather than putting away food. This of course has morphed through time, but drift fishing remains a direct-competition, male-dominated, somewhat isolating fishery (in the sense that the captain and deckhands on a vessel are each other's only company for weeks at a time). Further, it was rather apparent that most fishermen preferred one fishery over the other; few were interested in both fisheries.

15. Alternatives to Stimulate/Support Access

15.1.1. BBEDC

BBEDC's programs are designed with local access in mind, and they have achieved some success to that end. However, despite the challenges in connecting Bristol Bay residents with the Corporation's services, there existed a sense of optimism among interviewees that the locals-only financial assistance programs (e.g., the Permit Loan Program) are the key to halting or reversing the loss of local permits and stimulating participation in the fisheries by local residents. Suggestions as to how to increase the effectiveness of BBEDC's existing programs include streamlining and/or simplifying the application process, extending other programs to all watershed residents, and working to not only bring permits back to the region, but to prevent them from leaving in the future, i.e., through the formation of a community permit banking system.

15.1.2. Apprenticeship Programs

More than other types of alternatives, interviewees were specifically asked about the potential for an apprenticeship-style program to spur entry into the commercial fishing industry among local youth. Many responded positively, indicating that there is the possibility that such a program would be generally supported. Only a few people talked about apprenticeship programs as an alternative without being prompted, but those who did were emphatic that it would address barriers related to acquisition of fishing knowledge and experience, and also financial barriers if a temporary, provisional permit for new fishermen were issued free of charge upon completion of the program. At this stage, the feasibility of such a program is unknown.

15.1.3. Educational Permits

The use of educational limited entry permits in school and institutional settings has generally been low. The regulations pertaining to educational permits were specifically constructed to facilitate awareness of and hands-on experience in the State's limited entry commercial fisheries in a school setting. The Bristol Bay Borough School District is in the process of securing additional funding for a fisheries curriculum utilizing educational permits, with the idea of exposing kids to various aspects of the industry, from harvesting and processing to marketing and everything in between. Other suggestions about incorporating educational permits into a strategic approach to

encouraging entry into the fishery included targeting high-school age students from upriver villages to introduce them to fisheries in which they may not have any familial connections.

15.2. Creativity in Access

Fishermen are problem-solvers by nature. It follows, then, that when a fisherman who is determined to make a go of a fishing career runs into a barrier like the high cost of a fishing permit, he or she will find a way to make it work. From the interviews poured examples of fishermen taking advantage of the regulations to facilitate their own entry into the fisheries. One example in particular is the use of emergency medical transfers, colloquially called "leases"[13]. Others string together multiple access strategies throughout their careers, for example, leasing a permit for a season, perhaps jumping on a boat with family or friends the next, and buying a permit the third. This type of adaptability and creativity is how fishermen are often able to overcome fiscal barriers to entry.

16. Fishing Livelihood

16.1. Way of Life

Almost immediately in this study, it became apparent that local fishermen consider commercial fishing to be their way of life. A fishing livelihood looks different for every individual fisherman, but the cyclic and frantic nature of the fishing season dictates how they live their lives during the rest of the year. Fishing might be a family reunion, a means to support one's (or one's children's) college education, or part of a nomadic lifestyle spent in places outside Alaska. No matter what it looks like, many fishermen described their occupation as much more than a job:

> "[I was once told]: 'it's not about the money necessarily, it's about what you want to do that makes you happy'. And I could see fishing as being—it's a lifestyle…And I still think—I still believe it is, if people don't—nobody should go into fishing because it's for the money…if you don't love what you're doing, it's way too hard of work."
> —Dillingham drift fisherman, 5 October 2014

Fishermen also framed 'fishing as a lifestyle' in contrast to 'fishing for the money'. A passion for fishing is critical in their minds, and the monetary rewards are secondary. Many did concede that the amount of money that can be made during the short Bristol Bay fishing season is a benefit, but not necessarily a reason for them to keep participating in the fishery.

> "You can't be in it for the money."
> —Naknek fisherman, 10 May 2015

> "[My sister was] like, 'man, I didn't make any money fishing.' And I'm like, 'oh…you know, we're just in it for the killing anyway. (laughing) There's no guarantee you're making any money so you kinda just gotta be in it for the killing.' And she's like, 'that's disturbing.'"
> —Dillingham set net fisherman, 21 September 2015

For others, fishing is what raised them, and it cannot be separated from family. The links between family and fishing are embedded in their experiences growing up in a fishing culture.

> "For me, it's just kind of like family. I mean it's what raised me, pretty much. I think fishing is definitely where I got my work ethic for everything. And it's just like – fishing is life."
> —Naknek drift fisherman, 7 July 2014

[13] See section 6.3 Permit Dynamics: Emergency Medical Transfers

16.2. Small Business

On the other hand, fishing is seen as a business, though fishing as enterprise and fishing as livelihood are not mutually exclusive. Long-time fishermen recalled a shift over time in the way local people view fishing in Bristol Bay, gradually from a means to supplement and support subsistence activities with cash income, to a sole or primary occupation.

> Interviewee: …The way I look at it is kind of—we actually have a small business. If you take it outside of fishing. You're the president and CEO, you're the accountant, you're the maintenance man, you're the HR person—you know, all those things kind of wrapped up in your little business there. And you have to be kind of proficient at every one of them, right [laughs]? Because you're all integral to keep it going and being successful.
>
> Interviewer: Yeah, do you think that you have to see it as a business to fish?
>
> Interviewee: Oh yeah. I think that's the biggest mistake people make, is—and not, the lifestyle and the cultural thing, that's all part of it, but you have to treat it as a business.
> —Dillingham drift fisherman, 22 September 2015

Not only has this shift occurred, but, as the fisherman quoted above notes, it's impossible today to remain in the industry without a strategic approach to business planning, including minimizing costs, maximizing profits, and fishing competitively. People tended to attribute this shift to the globalized nature of the fishery; fishermen are no longer processing company employees, but small business owners actively participating in salmon market transactions. The knowledge required and the strategies employed to outcompete other fishermen (though many will say that they are only competing against themselves) are above and beyond that required to earn enough cash to put gas in the snowmachine and fuel in the oil stove for the winter.

16.2.1. Changing Livelihoods

How do young Bristol Bay residents view a life as a commercial fisherman? Young adults are statistically less likely to have families that depend on them than their parents' and grandparents' generations, so providing for family may or may not factor in one's decision to entry the fisheries. Commercial fishing may not be a young captain's first or only occupation, and based on the circumstances described by young fishermen interviewed for this study, they are likely to have become a permit holder at a later age than previous generations. This trend is not specific to fishing or Bristol Bay by any means; studies show the age at which people begin careers, get married, and start families has increased over time. It is certainly possible that these cultural and demographic trends are part of the larger pattern of increasing age of commercial fishery participants.

16.2.2. Subsistence and Commercial Fishing

There is a strong connection between subsistence and commercial fishing among Bristol Bay residents. When asked if kids that don't come from commercial fishing families have opportunities to get into the industry, interviewees explained that kids are able to get the experience of setting and picking nets, and of doing hard work through subsistence set net fishing. There is also a less strict distinction between the two types of fishing among commercial fishermen, partly because they are able to keep part of their catch to as a "homepack" for subsistence use. Some fishermen do, however, set a separate subsistence net on the beaches in or near their community. Regardless of where or how fishermen conduct their subsistence fishing activities, it's clear that the two practices are interwoven. One does not replace the other; rather, they are complementary.

16.3. Meaning of Fishing

To describe fishing as a livelihood rather than an occupation is to recognize the meanings, values, and identities associated with being a commercial fisherman. The practice of fishing gives people pride, particularly with respect to their ability to work hard, provide for their family, an carry on a long-held tradition within their community. Camaraderie, self-determination, competition—often with themselves rather than others—and humility are all values fishermen associated with their livelihoods. More so than most jobs, fishermen define themselves by the work they do, including its challenges and the pleasure they derive from just being on the water. Being a fisherman is an identity that is shaped by the places, social relationships, material objects, and physical processes that are required of and produced by the commercial fishing industry in Bristol Bay.

> Interviewee: …My world came to on a boat (makes explosion noise) 'Wow, where am I?!' That's how I remember the world. Being in a blue bucket.
>
> Interviewer: Wait, you were born on a boat—is that what you're saying?
>
> Interviewee: No, when I first got my [consciousness], 'wow, there's a moon, there's a sun…My world came to me in a boat.
> —Togiak drift fisherman, 3 October 2014

16.4. Governance, Fishing Culture, and Livelihoods

As the regulatory environment has changed through time, so too have the livelihoods of commercial fishermen in the Bay. Other elements of regional culture, such as subsistence hunting or the Yup'ik language, have been affected similarly by State and Federal regulations. The culture of fishing is unique, however, in that the Limited Entry Permit Program marked a shift in which many local people were systematically disenfranchised from their way of life as commercial fishermen.

> "And I feel really bad, because I feel that putting limited entry in, it almost stole the culture and the livelihood from the locals. Because they didn't understand what was really happening. And…if you couldn't prove that you fished during certain years, you couldn't get that limited entry either. And that's pretty sad, because who knows what those people were doing at the time."
> —Naknek set net fisherman, 26 February 2015

In less obvious ways, management, regulations, and industry practices have severed the connections between people and the Bay's fishing culture. Permit stacking[14], a proposed increase in the vessel length limit, a proposed permit buyback, and truncation of the season fishing are all examples of fisheries governance that have affected or could affect local participation in the fisheries, and thus the ability of local people to sustain livelihoods as fishermen.

17. Community Development Quota Program

A majority of the discussions surrounding the Community Development Quota (CDQ) Program resulted because we asked people about their level of awareness of the Bristol Bay Economic Development Corporation (BBEDC) and its programs. Nevertheless, among those who had some knowledge of BBEDC, salient themes emerged from interviews with respect to access and participation by local youth.

[14] See Section 6.4 Permit Dynamics: Permit Stacking and Dual Permits

There is a segment of the Bristol Bay population that is quite disconnected from BBEDC and their programs; I'm not entirely sure who they are, where they live, or why they might not have the same connection as someone who lives next door. It is possible that it's a function of whether a person lives in a village or a hub, and the connectivity of their community to BBEDC through a community liaison. I believe that there is one liaison for every CDQ-eligible community in the Bay. Even so, the level of awareness of BBEDC's opportunities then depends largely on the liaison him/herself, and the extent to which they advertise those opportunities. Awareness—or lack thereof—with BBEDC may also be affected by community of residence, or other factors like a person's level of social engagement in the community (i.e., talking to others, attending informational meetings, use of social media). It follows then, that without a minimal level of awareness, engagement with BBEDC and their programs is unlikely or impossible. Other reasons for a lack of engagement with BBEDC might include a lack of understanding of what exactly they can do for a Bristol Bay resident with respect to their fishing business, or difficulties in taking the preliminary steps of gathering three years' worth of financial information to apply for the programs.

17.1. The Divide Between CDQ and Non-CDQ Communities

Residents of all watershed communities are eligible for BBEDC's Permit Loan and Technical Assistance Programs, but not vessel acquisition or improvement loans, employment opportunities in Bering Sea offshore fisheries, fish totes, scholarships, grants, or other endowments. Bay residents are aware of the disparity in opportunities available to CDQ and non-CDQ residents; especially those living in non-CDQ communities:

> "I think we put it in terms of traditional use or traditional access to the fishery—communities—I don't know, I'm sure that opens I'm sure a whole can of worms that they don't—maybe have considered and maybe don't want to pursue, but I personally have brothers in Kokhanok and Igiugig and they spent every summer down here fishing and they fished their whole lives—I have access to a resource that they don't."
> —Kokhanok fisherman, 25 February 2015

The boundary for community eligibility extends inland 50 miles from the Bristol Bay coastline. The creation of this line in the 1990s created an invisible, yet not necessarily novel, division between coastal and upriver/lake communities in the Bay. Over the last four decades, the latter have developed more tenuous connections to the commercial fishing industry through outmigration of permits and permit holders. These connections, through establishment of the 50-mile limit and despite the best efforts of BBEDC to extend support to non-CDQ communities, remain fragile.

17.2. BBEDC's Residency Requirements

In some cases, people described friends or relatives that had moved from an upriver community to the coast solely for the purpose of establishing residency for the requisite year to be eligible for BBEDC programs. Similarly, a former resident of Togiak described her experience in obtaining a degree in fitness, but not being able to find work as a personal trainer or fitness coach in village. She moved to Anchorage to find work—in which she was successful—but wanted to buy into the fishery. She wanted to use the BBEDC Permit Loan Program for financial support, but she had to move back to Togiak for a full year before becoming eligible to apply. At the time of the interview, she was working outside her field (though not for lack of trying to start a personal training business in the village) and waiting to establish residency to use the BBEDC program. This anecdote is an example of the

contradiction that young people often find themselves in when they pursue a college degree, but then choose to also enter the commercial fisheries in their home community.

17.3. BBEDC's Other Programs

The financial grants and interest support make up a small percentage (by number) of the programs and services that BBEDC offers to its eligible residents. For instance, Permit Brokerage services help retain permits in the region by completing transfer paperwork with people, which allows BBEDC staff to understand people's motivations and personal situations that cause them to want to sell their permits, and by matching up local sellers with local buyers when possible. BBEDC also offers scholarships to local youth, summer internships, vocational training opportunities, financial counseling and business planning, fish totes and ice barges for fish quality improvement, and employment on jointly owned offshore catcher-processor vessels in Bering Sea groundfish fisheries. All of these programs were designed with the goal of sustaining and improving fishing communities through allocation of funds to best suit the region.

However, according to interviews with BBEDC staff, there are still hurdles for the Corporation to overcome. There remains a lack of qualified candidates to receive financing for permit purchases through state and private lenders (i.e., people still need to qualify for a loan from the state or CFAB which means they need good credit). The number of people that have successfully used BBEDC's Permit Loan Program is low but increasing, with 42 active participants between 2009 and the end of 2017. There is also a challenge in finding people to fill the open fishing and processing positions on BBEDC-jointly-owned vessels.

> Fisherman: …I think I've tooted the education horn pretty good. I think that's the best thing going. I really like to see those kinds of things. I like to see those programs from BBEDC. You know, those are—those are fantastic. I think that's great. I think it gives people the confidence to want to do better. You know, that's the biggest part, you know, being able to get financial funding and things. I always kind of knew, like the student loan forgiveness program, like even if I do rack up student loan debt, at least if I find a job that's related to my field, I'll be able to not have as big of a stress, and it's fantastic.
>
> Interviewer: So BBEDC does that, through the student loan program?
>
> Fisherman: Yeah.
>
> Interviewer: If you come back—do you have to work in your field or can you just...
>
> Fisherman: Yeah, technically, yeah, you have to work in your field. I mean, you know, it's always part of my applications. I put down that, you know, I work on our own equipment and it's related to the diesel field.
> —Naknek fisherman, 10 May 2015

17.4. Hope for the Future

People with awareness of BBEDC's programs held positive, optimistic feelings about the potential they hold for retaining permits in the Bay. There is consensus that the biggest threats to retention and reallocation of permits in the region are financial. If there are funds made available to residents for the purpose of purchasing permits, the thinking goes, then locals will have a much better chance of becoming competitive buyers of fishing rights than they would if they had to rely solely on their own sources of capital. Studies have shown that local residents do indeed have lesser financial resources to draw upon to invest in the fisheries; however, what has emerged from this study is

the finding that cultural and social barriers also play a significant role in access to and participation in the commercial fishing industry in Bristol Bay.